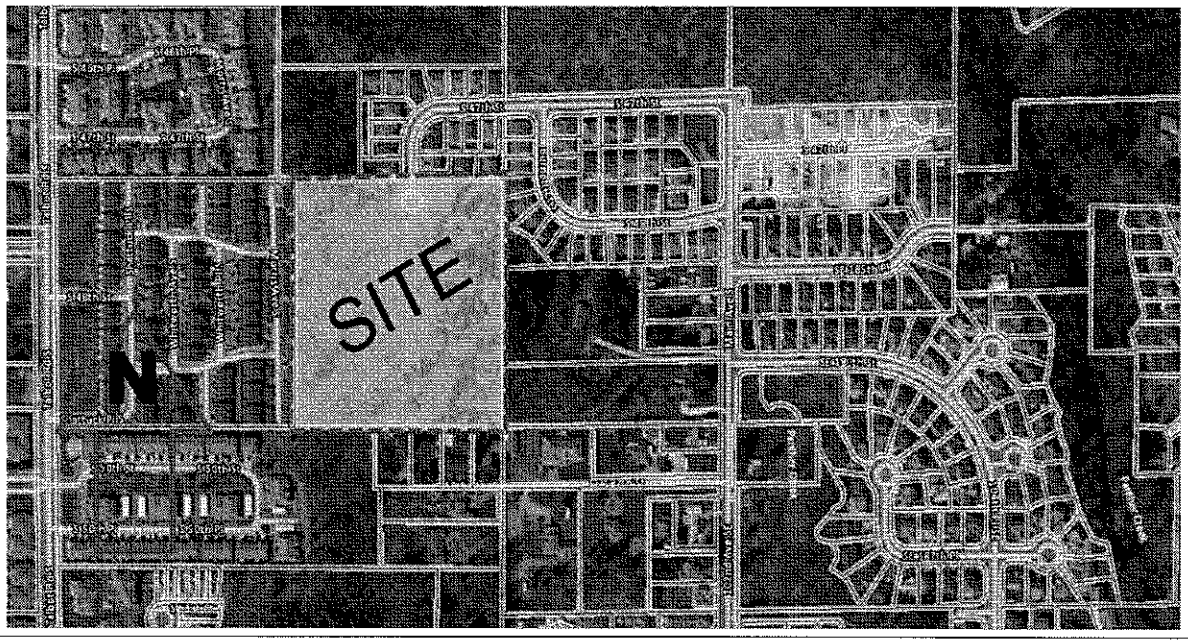
REPORT TO THE HEARING EXAMINER

A. SUMMARY AND PURPOSE OF REQUEST

HEARING DATE:	September 16, 2014
Project Name:	Vuecrest Estates Preliminary Plat
Owner:	Schneider Homes I, LLC; 6510 Southcenter Blvd #1; Tukwila WA 98188
Applicant:	Jamie Waltier; Harbour Homes; 1441 N 34th St #200; Seattle WA 98103
Contact:	Maher Joudi; DR Strong Consulting Eng; 10604 NE 38th Pl, Suite 232; Kirkland WA 98033
File Number:	LUA13-000642; ECF, PP, MOD
Project Manager:	Elizabeth Higgins, Senior Planner
Project Summary:	The project proponent has submitted an application for a Preliminary Plat subdivision, which requires an environmental review by the City of Renton Environmental Review Committee. The application includes a a request for Modification of Renton Municipal Code to allow a dead-end road in excess of 700 feet. Approval of the project would result in the subdivision of a 9.31 acre property, located in the Talbot planning area of the City, into 20 lots suitable for single-family residential use. The property has Comprehensive Plan designations of Residential Low Density, Residential Single-Family, and Residential Medium Density and is corespondlingly zoned Residntial 1, Residential 8, and Residential 14. The proposed density is 4.23 dwelling units per net acre. The west approximately one-third of the property is within the Talbot Urban Separator and is subject to City of Renton Urban Separator Overlay Regulations. The project site is currently undeveloped, except for a paved, temporary cul-de-sac.
Project Location:	4800 Block Smithers Ave S; Renton WA 98055
Site Area:	405,395 sf [9.31 acres] (263,328 sf [6.06 acres] to be developed)



Project Location Map

B. EXHIBITS:

Exhibit 1: Report to the Hearing Examiner
Exhibit 2: Neighborhood Detail Map
Exhibit 3: Zoning Map
Exhibit 4: Talbot Urban Separator Area Map
Exhibit 5: Preliminary Plat Plan
Exhibit 6: Public Comments
Exhibit 7: Topography Map
Exhibit 8: Tree Cutting / Land Clearing Plan
Exhibit 9: Replacement Tree Plan
Exhibit 10: Conceptual Landscape Plan
Exhibit 11: Technical Information Report, Revised
Exhibit 12: Generalized Utility Plan
Exhibit 13: Environmental Determination
Exhibit 14: Mitigation Measures
Exhibit 15: Format and Legal Description Review
Exhibit 16: Wetland Stream Review
Exhibit 17: Critical Area Study
Exhibit 18: Supplemental Stream Study
Exhibit 19: Geotechnical Review of Permit Documents
Exhibit 20: Geotechnical Addendum
Exhibit 21: Response to AES Geotechnical Review
Exhibit 22: Email: AES report correction
Exhibit 23: Geotechnical Review
Exhibit 24: Slope Setback Response
Exhibit 25: Email: Slope Setback
Exhibit 26: Protected Slope Analysis
Exhibit 27: Geotechnical Report
Exhibit 28: Storm Water Detention Vault
Exhibit 29: Proposed Stormwater Vault
Exhibit 30: Traffic Impact Analysis
Exhibit 31: Environmental Review Committee Staff Report

C. GENERAL INFORMATION:

1. **Owner(s) of Record:** Schneider Homes I, LLC; 6510 Southcenter Blvd #1; Tukwila WA 98188
2. **Comprehensive Plan Land Use Designation:** Residential Low Density (RLD), Residential Single-Family (RSF), Residential Medium Density (RMD)
3. **Zoning Designation:** Residential 1 (R-1), Residential 8 (R-8), Residential 14 (R-14)
4. **Existing Site Use:** Undeveloped
5. **Neighborhood Characteristics:**
   a. **North:** Talbot Ridge residential development (R-1 and R-8 zones)
   b. **East:** Reserve at Stonehaven and low-density residential development (zoned R-8)
   c. **South:** Low-density residential development (R-1 and R-8 zones)
   d. **West:** Talbot Park and Campen Springs residential developments (R-1 and R-14 zones)

6. **Access:** Smithers Ave S via Main Ave S
7. **Site Area:** 405,395 sf [9.31 acres] (263,328 sf [6.06 acres] to be developed)

D. HISTORICAL/BACKGROUND:

Action	Land Use File No.	Ordinance No.	Date
Comprehensive Plan	N/A	5100	11/01/04
Zoning	N/A	5100	11/01/04
Annexation	N/A	3268	12/13/78

E. PUBLIC SERVICES, EXISTING CONDITIONS:

1. **Utilities**
   a. Water: This site is located in the Renton Water Service area, but the nearest water service is provided by the Soos Creek Water and Sewer District (SCWSD).
   b. Sewer: The site is provided sanitary sewer service by the City of Renton. There is a sewer main and a manhole at the south end of Smithers Ave S.
   c. Surface/Storm Water: There are no storm drainage improvements at the end of Smithers Ave S. Drainage must be directed to an existing system located to the west in Talbot Rd S.
2. **Streets:** There is a public street terminating in a temporary cul-de-sac at the end of Smithers Ave S.
3. **Fire Protection:** City of Renton Fire Department provides emergency services.

F. PROJECT NARRATIVE:

In 2013, the project proponent submitted a land use master application for subdivision of a 9.31 acre property located in the Talbot Planning Area of South Renton [Exhibit 2]. During the application review, the City of Renton required additional information to be submitted. A "hold" was placed on the project review on July 16, 2013. The requested additional information was submitted and project review recommenced on July 22, 2014. The project was revised with the following results: the number of lots was reduced by one to 20, lot sizes changed, the primary access road was realigned slightly to the east, a rockery retaining wall was eliminated from the top of a steep slope, grading on the west side of the portion of the site to be developed was modified, and the surface water control plan revised.

The project is subject to State Environmental Protection Act (SEPA) compliant environmental review and Preliminary Plat approval for the subdivision. The project proponent submitted a request for Modification of Renton Municipal Code to allow a dead-end road in excess of 700 feet. The site has two Category 2 wetlands, one of which connects to a class 4 stream.

The site contains three land use zones, Residential 1 dwelling unit per net acre (du/ac), Residential 8 (8 du/ac) and Residential 14 (14 du/ac) [Exhibit 3]. Additionally, the area zoned R-1 is located within the Urban Separator overlay. Only the 6.06 acre (263,328 sf) portion that is zoned R-8 is proposed to be developed. The proposed density would be 4.23 du/ac Subdivision into 20 lots would result in a density of 4.05 dwelling units per net acre. Lot sizes would range from 4,500 square feet to 8,134 square feet. In addition to the 20 lots, 6 tracts are proposed for sensitive areas and tree retention.

The site is proposed to be accessed via an extension of Smithers Ave. S. The requested modification of Renton Municipal Code, if approved, would permit this access although it is considered to be a "dead end" road from the intersection of SE 186th St.

The undeveloped site has approximately 400 trees that have been deemed to be "significant." Trees will be removed, retained, and replaced as required by Renton Municipal Code. An estimated 3,396 cy of cut and 10,035 cy of fill would be required for site construction. A stormwater detention vault is proposed that would discharge to a closed conveyance system on site and subsequently transported to an area-wide system off site. The applicant has submitted a Critical Areas Report, Supplement Stream Study, Traffic Impact Analysis, Slope Analysis, Geotechnical Engineering study, and a Drainage Technical Information Report with the application.

Goals, objectives, and policies of the Residential Low Density (RLD), Residential Single-Family (RSF), and Residential Medium Density (RMD) Comprehensive Plan Land Use designations are implemented by the regulations and standards of the Residential 1, Residential 8, and Residential 14 zones respectively.

The property is also in the Talbot Urban Separator of the City [Exhibit 4].

G. APPLICABLE SECTIONS OF THE RENTON MUNICIPAL CODE:

1. **Chapter 2 Land Use Districts**
   a. Section 4-2-020: Purpose and Intent of Zoning Districts
   b. Section 4-2-070: Zoning Use Table
   c. Section 4-2-110: Residential Development Standards
2. **Chapter 3 Environmental Regulations and Overlay Districts**
   a. Section 4-3-050: Critical Areas Regulations
   b. Section 4-3-110: Urban Separator Overlay Regulations
3. **Chapter 4 Property Development Standards**
   a. Section 4-4-030: Development Guidelines and Regulations
   b. Section 4-4-070 Landscaping
   c. Section 4-4-130: Tree Cutting and Land Clearing Regulations
4. **Chapter 6 Streets and Utility Standards**
   a. Section 4-6-060: Street Standards
5. **Chapter 7 Subdivision Regulations**
   a. Section 4-7-080: Detailed Procedures for Subdivisions
   b. Section 4-7-120: Compatibility with Existing Land Use and Plan – General Requirements and Minimum Standards
   c. Section 4-7-150: Streets – General Requirements and Minimum Standards
   d. Section 4-7-160: Residential Blocks – General Requirements and Minimum Standards
   e. Section 4-7-170: Residential Lots – General Requirements and Minimum Standards
5. **Chapter 9 Procedures and Review Criteria**
6. **Chapter 11 Definitions**

H. APPLICABLE SECTIONS OF THE COMPREHENSIVE PLAN:

1. Land Use Element
2. Community Design Element

I. MODIFICATION REQUEST

The project proponent submitted a request to modify Renton Municipal Code 4-6-060 "Street Standards," Section H, "Dead End Streets." RMC 4-6-060H states that cul-de-sac turnarounds and dead end streets are only permitted when there are demonstrable physical constraints and no future connection to a larger street pattern is physically possible. In addition, this section of the RMC further requires a secondary access be provided when the primary access is a dead end street longer than 700 feet.

The proposed project site is located at the end of an existing dead end street in excess of 700 feet. The proposal asks for approval of a temporary cul-de-sac on an extension of this street. The length of the extended dead-end street would be approximately 2,364 feet, from the point at which it becomes a dead end at Main Avenue South (SE 102nd St) and SE 186th St to the new street end within the proposed project.

Currently, there are 99 lots that are accessed by this dead end street. Previous land use actions assumed a second access would eventually become available. The Renton Fire Department does not support the current request to continue modification of the RMC requirement for a secondary access, due to concerns for public health and safety in the event of an emergency situation. The Department of Community and Economic Development also does not support the modification request because the project proponent has not demonstrated that there are insurmountable physical constraints and/or future connection to the wider system is not possible. (For additional discussion and staff recommendation, see Section K. 9 "Impact on Public Services – Fire," below)

J. FINDINGS OF FACT:

1. The project proponent submitted a land use master application for a preliminary plat subdivision of a 9.31 acre site into 20 lots and 6 tracts [Exhibit 5]. The tracts are for storm drainage, tree retention, and critical areas (protected slopes, wetlands, and a stream). The proposal would have a density of 4.23 dwelling units per net acre.
2. The land use master application includes a request to modify the Renton Municipal Code 4-6-060H to allow access by a dead end street longer than 700 feet, without a secondary access. Staff recommends that the Modification request be denied, although the decision lies with the Hearing Examiner.
3. The Planning Division of the City of Renton accepted the land use permit master application for review on May 21, 2013, and determined the application complete on June 7, 2013. The project complied with the 120-day review period. The project was placed on "hold" on July 16, 2013, due to the requirement that a secondary geotechnical study be completed. The hold was removed, upon submittal of additional information, on July 22, 2014. There were numerous written comments submitted [Exhibit 6].
4. The City required stormwater to be conveyed from a vault to an existing stormwater system at the bottom of the protected slope by means of a 12-inch diameter pipe. This conveyance on the protected slope meets the requirements for an exemption from the Critical Areas Regulations.
5. The proposed plat would be located south of Smithers Ave S, south of S 47th St.
6. The property has Residential Low Density (RLD), Residential Single-Family (RSF), and Residential Medium Density (RMD) Comprehensive Plan land use designations, the policies of which are implemented by the regulations and standards of the Residential 1 (R-1), Residential 8 (R-8), and

Residential 14 (R-14) zoning classifications, respectively. Only that portion of the property designated RSF and zoned R-8 is proposed for development. The RSF designation is intended to be used for quality detached residential development organized into neighborhoods at urban densities.

7. The proposed residential lots would range in size from 4,500 sf to 6,650 sf.

8. The site is not developed, with the exception of a paved temporary cul-de-sac, located at the terminus of Smithers Ave S on the north portion of the property.

9. The following are proposed lot sizes and approximate dimensions for Lots 1-20 and Tracts A through E:

Lots	**Lot Size** (Minimum 4,500 sf)	**Width** (Minimum 50 ft., except 60 ft. for corner lots)	**Depth** (Minimum 65 ft.)
Lot 1	6,069 sf	51.23 feet	121.89 feet (average)
Lot 2	6,008 sf	51.74 feet	124.43 feet (average)
Lot 3	6,265 sf	51 feet	124.06 feet (average)
Lot 4	6,205 sf	50.18 feet	124.25 feet (average)
Lot 5	6,017 sf	50 feet	119.21 feet (average)
Lot 6	5,936 sf	53 feet	112.90 feet (average)
Lot 7	6,436 sf	50.42 feet	120.63 feet (average)
Lot 8	6,650 sf	51.2 feet	132.72 feet (average)
Lot 9	8,134 sf	90.08 feet	136.36 feet (average)
Lot 10	4,972 sf	50 feet	95.45 feet (average)
Lot 11	5,129 sf	50 feet	102.58 feet
Lot 12	5,237 sf	60 feet (corner lot)	90 feet
Lot 13	4,500 sf	50 feet	90 feet
Lot 14	4,500 sf	50 feet	90 feet
Lot 15	4,500 sf	50 feet	90 feet
Lot 16	5,323 sf	60 feet (corner lot)	90 feet
Lot 17	4,985 sf	67.32 feet (corner lot)	80 feet
Lot 18	4,507 sf	56.25 feet	80 feet
Lot 19	5,528 sf	61.33 feet (average)	88.96 feet (average)
Lot 20	5,622 sf	64.54 feet (average)	88.84 (average)
Tract A	16,426 sf		
Tract B	48,847 sf		
Tract C	18,513 sf		
Tract D	1,458 sf		
Tract E	24,017 sf		

10. Tract A would be the site of a stormwater control vault. Tracts B and E would be sensitive areas (wetland) and C an area for tree retention. Tract D would be an open space.

11. Proposed Lots 1-8 would be directly accessed from Smithers Ave S; Lots 9 and 10 would be accessed from a new street, S 48th Pl (SE 186th Pl); Lots 11 – 16 would be accessed from the alley; and Lots 17 - 20 would be accessed from a private access easement (S 47th CT). Tracts A and D would be accessed from Smithers Ave S and Tract E from the alley. Tracts B, C, and F would be inaccessible to vehicles .

12. Topographically, the site has a wide-range of slopes, from 2 percent to greater than 75 percent within the proposed development area [Exhibit 7]. The steepest slopes are to the west of the development area and consist of slopes deemed to be "protected" by the Renton Municipal Code. This area would be preserved as a Native Growth Protection Area within Tract A.

13. There are 401 trees on the site that have been deemed "significant." Renton Municipal Code requires that, of these, 65 trees must be retained or replaced. The Tree Cutting / Land Clearing Plan [Exhibit 8] indicates 42 trees would be retained; therefore, new trees must be planted. The plan proposes that 140 two-inch caliper replacement trees (280.8 caliper inches) would be planted on the site [Exhibit 9].

14. The preliminary landscape plan indicates street trees would be planted along the public and private streets [Exhibit 10]. Additional landscaping is proposed although the landscape plan is currently "conceptual" only. A "Landscape Plan, Detailed," as per RMC 4-8-120L, must be submitted prior to issuance of construction permits.

15. A drainage report and drainage plan, "Technical Information Report for Vuecrest Estates," Revised, July 15, 2014, by D.R. Strong Consulting Engineers, Inc., was submitted [Exhibit 11]. The report demonstrates compliance with 2009 King County Surface Water Manual and additional requirements, based on specific site conditions, as required by the Department Community and Economic Development.

16. Although the project site lies within the boundaries of the Renton Water Service Area, the City does not have water service mains near the project site. Water service would be provided by the Soos Creek Water and Sewer District from an existing water main located at the Smithers Ave S street end at the north portion of the property. A certificate of water availability from SCWSD must be provided prior to issuance of construction permits.

17. Sanitary sewer service would be provided by the City of Renton. [Exhibit 12].

18. Pursuant to the City of Renton's Environmental Ordinance and State Environmental Policy Act (SEPA RCW 43.21C, 1971 as amended), on August 26, 2014, the Environmental Review Committee issued a Determination of Non-Significance - Mitigated (DNS-M) for the Vuecrest Estate Preliminary Plat [Exhibit 13]. The DNS-M included 9 mitigation measures [Exhibit 14]. A 14-day appeal period commenced on August 29, 2014, and ended on September 12, 2014, no appeals of the threshold determination were filed.

19. No agency comments were submitted, but there were numerous public comments received during public comment period [Exhibit 6].

20. Representatives from various city departments have reviewed the application materials to identify and address issues raised by the proposed development. These comments are contained in the official file, and the essence of the comments has been incorporated into the appropriate sections of this report and the Departmental Recommendation at the end of this report.

K. CONCLUSIONS:

PRELIMINARY PLAT REVIEW CRITERIA: Approval of land subdivision is based upon several factors. The following criteria have been established to assist decision-makers in the review of the plat. (✓ Compliant; Note 1: Partially compliant; Note 2: Not compliant; Note 3: Compliance not yet demonstrated)	
1. CONFORMANCE WITH THE COMPREHENSIVE PLAN: The site is designated Residential Low Density (RLD), Residential Single-Family (RSF), Residential Medium Density (RMD) on the Comprehensive Plan Land Use Map, although only the portion zoned RSF is proposed for development. The proposal is consistent with the following Comprehensive Plan Land Use and Community Design Element policies if the project is developed compliant with all regulations and conditions of approval.	
✓	**Land Use Goal 1:** Plan for future growth of the Urban Area based on regionally developed growth forecasts, adopted growth targets, and land capacity as determined through implementation of the Growth Management Act.
	Land Use Goal 7: Promote new development and neighborhoods in the City that:

✓	a. Contribute to a strong sense of community and neighborhood identity;
Note 2	b. Are walkable places where people can live, shop, play, and get to work without always having to drive; *Staff Comment: While there would be a system of sidewalks throughout the plat, the context of the development precludes pedestrian access to shopping or employment opportunities.*
✓	c. Are developed at densities sufficient to support public transportation and make efficient use of urban services and infrastructure;
✓	d. Offer a variety of housing types for a population diverse in age, income, and lifestyle;
✓	e. Are varied or unique in character;
✓	f. Support "grid" and "flexible grid" street and pathway patterns where appropriate;
✓	g. Are visually attractive, safe, and healthy environments in which to live;
✓	h. Offer connection to the community instead of isolation; and
✓	i. Provide a sense of home.
	Land Use Objective LU-FF: Manage and plan for high quality residential growth in Renton and the Potential Annexation Area that:
✓	a. Supports transit by providing urban densities,
✓	b. Promotes efficient land utilization, and
Note 1	c. Creates stable neighborhoods incorporating built amenities and natural features. *Staff Comment: There are no existing built amenities at the location of the proposed project.*
✓	**Policy LU-140.** Pursue multiple strategies for residential growth including: Infill development on vacant and underutilized parcels in Renton's established neighborhoods
✓	**Policy LU-146.** Small-lot, single-family infill developments and plats should be supported as alternatives to multi-family development to both increase the City's supply of single-family detached housing and provide homeownership opportunities.
✓	**Policy LU-158.** Net development densities should fall within a range of 4.0 to 8.0 dwelling units per acre in Residential Single Family Neighborhoods.
✓	**Policy LU-159.** Maximum height of structures should not exceed two (2) stories in single-family residential neighborhoods.
Note 1	**Policy LU-160.** Designate land for Residential Single-Family land use where there is an existing pattern of single-family development in the range of four to eight units per net acre and where critical areas are limited. *Staff Comment: The proposed project is only partially compliant due to the presence of steep slopes and wetlands.*
Note 2	**Community Design Objective CD-D:** New development should have an interconnected road network that supports multi-modal transportation. *Staff Comment: The proposed project is not compliant due to the lack of connection to a larger vehicular circulation system. Multi-modal transportation opportunities are not available at this location.*
✓	**Policy CD-19.** Land should be subdivided into blocks sized so that walking distances are minimized and convenient routes between destination points are available.
✓	**Policy CD-20.** Orient site and building design primarily toward pedestrians through master planning, building location, and design guidelines.
✓	**Policy CD-22.** During land division, all lots should front streets or parks.
Note 2	**Policy CD-25.** Streets, sidewalks, and pedestrian or bike paths should be arranged as an

	interconnecting network. Dead-end streets and cul-de-sacs should be discouraged. A grid or "flexible grid" pattern of streets and pathways, with a hierarchy of widths and corresponding traffic volumes, should be used. *Staff Comment: Both a dead-end street and cul-de-sac are proposed. See Section I "Modification Request" above.*
✓	**Policy CD-26.** Interpret development standards to support plats designed to incorporate vehicular and pedestrian connections between plats and neighborhoods. Future street connections should be clearly identified to notify residents of future roadway connections.
✓	**Objective CD-E:** New development and infill patterns should be consistent with a high quality urban form.
✓	**Policy CD-34.** Support project site planning in residential land use designations that incorporates the following, or similar elements, in order to meet the intent of the objective:
✓	a. Buildings oriented toward public streets,
✓	b. Private open space for ground-related units,
✓	c. Common open or green space in sufficient amount to be useful,
✓	d. Landscaping of all pervious areas of the property, and
✓	e. Landscaping, consisting of groundcover and street trees (at a minimum), of all setbacks and rights-of way abutting the property.
✓	**Policy CD-39.** Ensure quality development by supporting site plans and plats that incorporate quality building, development, and landscaping standards that reflect unity of design and create a distinct sense of place.
✓	**Policy CD-40.** Use design regulations to provide direction on site design, building design, landscape treatments, and parking and circulation.
✓	**Policy CD-41.** Site design of development should relate, connect, and continue design quality and site function from parcel to parcel.
✓	**Policy CD-42.** Site design should address the effects of light, glare, noise, vegetation removal, and traffic in residential areas. Overall development densities may be reduced within the allowed density range to mitigate potential adverse impacts.
Note 3	**Objective CD-F:** Ensure privacy and personal space in residential developments. *Staff Comment: Assurance of privacy and personal space would be demonstrated with the development of individual lots.*
Note 3	**Policy CD-44.** Development should be designed (e.g. site layout, building orientation, setbacks, landscape areas and open space, parking, and outdoor activity areas) to result in a high quality development as a primary goal, rather than to maximize density as a first consideration. *Staff Comment: Assurance of high quality design and development would be demonstrated with the development of individual lots.*
Note 3	**Policy CD-45.** Interpret development standards to support new plats and infill project designs that address privacy and quality of life for existing residents. *Staff Comment: Assurance of privacy and quality of life would be demonstrated with the development of individual lots.*
✓	**Policy CD-50.** Support site plans that transition to and blend with existing development patterns using techniques such as lot size, depth and width, access points, building location setbacks, and landscaping. Sensitivity to unique features and differences among established neighborhoods should be reflected in site plan design. Interpret development standards to support ground-related orientation, coordinated structural design, and private yards or substantial common space areas.
✓	**Policy CD-53.** Consideration of the scale and building style of near-by residential

	neighborhoods should be included in development proposals.
✓	**Policy CD-57.** Single-family lot size, lot width, setbacks, and impervious surface should be sufficient to allow private open space, landscaping to provide buffers/privacy without extensive fencing, and sufficient area for maintenance activities.
2. COMPLIANCE WITH THE UNDERLYING ZONING DESIGNATION: The portion of the site proposed for development is classified **Residential 8 (R-8)** on the City of Renton Zoning Map. RMC 4-2-110A provides development standards for development within the R-8 zoning classification. The proposal is consistent with the following development standards, if the project complies with all regulations and conditions of approval.	
✓	**Density:** The minimum density allowed in the R-8 zone is 4 dwelling units per net acre (du/ac). The maximum density permitted in the R-8 zone is 8.0 du/ac. Net density is calculated after the deduction of critical areas, areas intended for public rights-of-way, and private access easements. *Staff Comment: Based on gross site area of 263,328 sf (area zoned R-8), there would be 39,956 sf deducted for public streets; 7,674 sf deducted for a private access road and alley; 9,571 sf for sensitive areas (slope and wetland), therefore, the net area to be developed would be 206,127 sf (4.73 ac). The 20 lot plat would have a net density of 4.23 dwelling units per net acre, which is within the allowed range for the R-8 zone.*
✓	**Lot Dimensions:** The minimum lot size permitted in the R-8, for parcels larger than 1 acre before subdivision, is 4,500 sf. A minimum lot width of 50 feet for interior lots and 60 feet for corner lots, as well as a minimum lot depth of 65 feet, is also required. Insofar as practical, side lot lines shall be at right angles to street lines or radial to curved street lines. *Staff Comment: As demonstrated in finding of fact 7, table above, all lots would meet the requirements for minimum lot size, depth, and width.*
Note 3	**Setbacks:** The required setbacks in the R-8 zone are as follows: The minimum front yard setback is 15 feet; minimum side yard is 5 feet and, if along a public street, 15 feet for the primary structure; minimum rear yard is 20 feet. *Staff Comment: Setbacks are dimensioned on the Preliminary Plat plan and would be verified at the time of building permit review. The lots would be sufficient size to accommodate a single family home and meet the setback requirements.*
Note 3	**Building Standards:** Building height is restricted to 30 feet and 2-stories. Detached accessory structures must remain below a height of 15 feet and one-story. The allowed building lot coverage for lots over 5,000 sf in size in the R-8 zone is 35 percent or 2,500 sf, whichever is greater. For lots 5,000 sf or less, the maximum coverage allowed is 50 percent. The allowed impervious surface coverage is 75 percent. *Staff Comment: The building standards for the proposed lots would be verified at the time of building permit review.*
Note 1	**Landscaping:** On-site Landscaping Requirements: Ten feet of on-site landscaping is required along all public street frontages, including sideyards that abut public streets, with the exception of areas for required walkways and driveways per RMC 4-4-070. Landscaping Requirements Within the Public Right-of-Way: A landscaped area with the minimum dimension of 8 feet in width is required abutting Smithers Ave S, S 47th Ct, and S 48th Pl (as per RMC 4-6-060F). Yards abutting public streets must have all pervious areas landscaped in accordance with RMC 4-4-070.

	Staff Comment: Street trees are shown on the conceptual landscape plan. The conceptual landscape plan, however, does not specify plants within the required 10-foot wide on-site landscape area. *Street trees should not be Callery Pear, as shown on landscape plan, due to their small size at maturity. Use only species/cultivars that attain a large-at-maturity size. Street trees along S 48th Pl should be different from those on Smithers Ave S, for visual variety and health of the ecosystem.* *Staff recommends, as a condition of approval, the applicant be required to submit a revised landscape plan, meeting all landscape requirements. The final detailed landscape shall be submitted to and approved by the Current Planning Project Manager prior to issuance of construction permits.*
✓	**Parking:** Each unit is required to accommodate off street parking for a minimum of two vehicles. *Staff Comment: Sufficient area exists, on each lot, to accommodate off-street parking for a minimum of two vehicles.*
3. DESIGN STANDARDS: RMC 4-2-115 delineates residential and open space standards for development within the R-8 zoning classification. The proposal is consistent with the following design standards if compliant with all conditions of approval.	
Note 3	**Lot Configuration:** One of the following is required: a. Lot width variation of 10 feet (10') minimum of one per four (4) abutting street-fronting lots, or b. Minimum of four (4) lot sizes (minimum of four hundred (400) gross square feet size difference), or c. A front yard setback variation of at least five feet (5') minimum for at least every four (4) abutting street fronting lots. *Staff Comment: It appears from the proposed plan that option c, above, would be the only one available to meet the Lot Configuration requirement. Compliance would be demonstrated when building permit applications are submitted.*
Note 3	**Garages:** The minimization of the visual impact of garages contributes to creating communities that are oriented to people and pedestrians, as opposed to automobiles. One of the following is required: 1. Recessed from the front of the house and/or front porch at least 8 feet, or 2. Located so the roof extends at least 5 feet (excluding eaves) beyond the front of the garage for at least the width of the garage, plus the porch/stoop area, or 3. Alley accessed, or 4. Located so that the entry does not face a public and/or private street or an access easement, or 5. Sized so that it represents no greater than 50 percent of the width of the front façade at ground level, or 6. Detached. The portion of the garage wider than 26 feet across the front shall be set back at least 2 feet. *Staff Comment: Building plans, which would be used to determine visual impact of garages, have not been submitted. They would be submitted for building permit review (compliance not demonstrated).*

Note 3	**Primary Entry:** Entrances to houses shall be a focal point and allow space for social interaction. One of the following is required: 1. Stoop: minimum 4 feet by 6 feet and 12 inches above grade, or 2. Porch: minimum 5 feet deep and 12 inches above grade. Exception: An ADA accessible route may be taken from a front driveway. *Staff Comment: Building designs, which would be used to evaluate design of entrances, have not been submitted. They would be submitted for building permit review (compliance not demonstrated).*
Note 3	**Façade Modulation:** Buildings shall not have monotonous facades along public areas. One of the following is required: 1. An offset of at least one story that is at least 10 feet wide and 2 feet in depth on façades visible from the street, or 2. At least a 2-foot offset of second story from first story on one street-facing façade. *Staff Comment: Building designs, which would be used to evaluate design of entrances, have not been submitted. They would be submitted for building permit review (compliance not demonstrated).*
Note 3	**Windows and Doors:** Windows and front doors are an integral part of the architectural character of a house. Windows and doors shall constitute 25 percent of all façades facing street frontage. *Staff Comment: Building designs, which would be used to evaluate design of entrances, have not been submitted. They would be submitted for building permit review (compliance not demonstrated).*
Note 3	**Scale, Bulk, and Character:** Neighborhoods shall have a variety of home sizes and character. Abutting houses shall have differing architectural elevations. Both of the following are required: 1. A minimum of three differing home models for each ten contiguous abutting homes, and 2. Abutting houses must have differing architectural elevations. *Staff Comment: Building designs, which would be used to evaluate design of entrances, have not been submitted. They would be submitted for building permit review (compliance not demonstrated).*
Note 3	**Roofs:** Roof forms and profiles are an important architectural component. One of the following is required: 1. Hip or gabled roof with at least a 6:12 pitch for the prominent form of the roof (dormers, etc.) may have lesser pitch, or 2. Shed roof. *Staff Comment: Building designs, which would be used to evaluate design of entrances, have not been submitted. They would be submitted for building permit review (compliance not demonstrated).*
Note 3	**Eaves:** Eaves and overhangs act as unifying elements in the architectural character of a house. Both of the following are required: 1. Eaves projecting from the roof of the entire building at least 12 inches with horizontal fascia or fascia gutter at least 5 inches deep on the face of all eaves, and

	2. Rakes on gable ends must extend a minimum of 2 inches from the surface of exterior siding materials. *Staff Comment: Building designs, which would be used to evaluate design of entrances, have not been submitted. They would be submitted for building permit review (compliance not demonstrated).*
Note 3	**Architectural Detailing:** Architectural detailing contributes to the visual appeal of a house and the community. If one siding material is used on any side of the dwelling that is two stories or greater in height, a horizontal band that measures at least 8 inches is required between the first and second story. Also, one of the following is required: 1. Minimum 3-1/2 inch trim surrounds all windows and details all doors, or 2. A combination of shutters and minimum 3-1/2 inch trim details all windows and minimum 3-1/2 inch details all doors. *Staff Comment: Building designs, which would be used to evaluate design of entrances, have not been submitted. They would be submitted for building permit review (compliance not demonstrated).*
Note 3	**Materials and Color:** A variety of materials and color contributes to the diversity of housing in the community. Abutting houses shall be different colors. Color palettes for all new dwellings, coded to the building elevations, shall be submitted for approval. Additionally, one of the following is required: 1. A minimum of 2 colors shall be used on the building (a main color with different trim color is acceptable), or 2. A minimum of 2 different siding materials shall be used on the building. One siding material shall comprise a minimum 30 percent of the street-facing façade. If masonry siding is used, it shall wrap the corners no less than 24 inches. *Staff Comment: Building designs, which would be used to evaluate design of entrances, have not been submitted. They would be submitted for building permit review (compliance not demonstrated).*

4. TECHNICAL SERVICES: There are technical issues related to the preliminary and final plat that must be addressed prior to recording the plat. These issues have been clarified in comments from the Department of Community and Economic Development and are included in Exhibit 15.

5. CRITICAL AREAS: There are protected slopes, wetlands, and a stream located within proposed sensitive area tracts (Native Growth Protection Areas) on the site. The anticipated impacts of these areas have been addressed in technical reports and studies [Exhibits 16-27] and the Environmental Review Committee Report [Exhibit 31]. The project complies with all critical area regulations provided all mitigation measures are met identified in the Environmental Review Committee Report.

A Critical Area Exemption is required to allow placement of a tight-lined stormwater conveyance system in an area identified as a "protected slope." Storm drainage piping is an activity deemed exempt from the Critical Areas Regulations (RMC 4-3-050C.5.d.iv) as follows: Installation of new storm drainage lines in any geologic hazard area when a geotechnical report clearly demonstrates that the installation would comply with the criteria listed in RMC 4-3-050J2b and that the installation would be consistent with each of the purposes of the geologic hazard regulations listed in RMC 4-3-050A4. Also, to qualify for the exemption, the report must propose appropriate mitigation for any potential impacts identified in the report.

Staff Comment: The stormwater outfall high density polyethylene (HDPE) pipe must be secured to the ground by using anchors and concrete. At the top the pipe is secured to a vault and at the base it is secured with a slip joint and concrete block. The slip joint is needed because thermo-elastic expansion and contraction of the

pipe will be occurring due to differing temperatures. Typically HDPE above ground pipe installations need to have anchors for each 50 lineal feet of pipe placed. The City has successfully placed numerous outfall projects of these types at steep, erosive slopes. These types of outfall installations reduce wet soil bearing weight, erosion, trenching and other negative effects on the steep slope while retaining more trees and vegetation that assist with stabilizing the slope. (See also Section 8 "Stormwater" below)	
6. COMMUNITY ASSETS: The proposal is consistent with the following community asset requirements:	
Note 2	**Tree Retention:** RMC 4-4-130 states 30 percent of the trees shall be retained in a residential development. *Staff Comments: There are approximately 401 trees deemed to be "significant" (over 6 inches in diameter) on the site. Of these, none have been determined to be dead, diseased, or dangerous. The tree retention formula, as per RMC 4-4-130H, for the R-8 zone, requires that 65.4 trees must be retained. The project proposal indicates that 42 trees would be retained. Therefore, 140 two-inch diameter trees, or 280.8 "replacement inches" are required. A tree replacement plan has been submitted indicating 69 two-inch diameter trees would be planted. Staff recommends the Replacement Tree Plan be revised to show the proposed locations for replanting 140 two-inch diameter replacement trees.* *Tree protection measures during construction shall be required as per RMC 4-4-130H8 and 9.*
7. COMPLIANCE WITH URBAN SEPARATOR OVERLAY REGULATIONS: RMC 4-3-110 provides requirements for development of land within the Urban Separator Overlay area of the City. Regulations listed below are applicable to Portions of the Urban Separator Outside the Established Contiguous Open Space Corridor or are Standards within the entire Urban Separator (the Talbot Urban Separator does not include a Contiguous Open Space Corridor).	
✓	**Dedicated Open Space:** Fifty percent of the gross area of that portion of a property within the [Talbot] Urban Separator Overlay area shall be designated as a non-revocable open space tract.
✓	**Uses Allowed:** Uses shall be consistent with RMC 4-2-060 and 4-2-070B (Residential-1 Zone)
✓	**Forest/Vegetation Clearing:** Clearing shall be limited to a maximum of 35 percent of the gross acreage of the area within the Urban Separator.
✓	**Stormwater Management:** Stormwater management shall comply with the Surface Water Design Manual.
✓	**Private Access Easements:** Private access easements and improvements shall be established at the minimum standard needed to meet public safety requirements.
Note 3	**Landscape Plans:** Landscape plans required in RMC 4-4-070 shall include retention/replanting plans as applicable, consistent with standards and plant lists in King County Department of Natural Resources and Parks Water and Land Resources Division Publication, "Going Native." *Staff Comment: Staff recommends a condition of approval requiring replanting of vegetation to replace vegetation (trees, shrubs, and ground cover) removed for installation of the stormwater conveyance between the stormwater vault and the west property boundary of the property. This area lies within the Talbot Urban Separator.*
8. COMPLIANCE WITH SUBDIVISION REGULATIONS: RMC 4-7 Provides review criteria for subdivisions. The proposal is consistent with the following subdivision regulations if compliant with all regulations and conditions of approval.	
✓	**Access:** Each lot must have access to a public street or road. Access may be by private access easement street per the requirements of the street standards.
N/A	**Blocks:** Blocks shall be deep enough to allow two tiers of lots. *Staff Comment: Depth of property limits this requirement.*
Note 3	**Streets:** The proposed street system shall extend and create connections between existing

	streets per the Street Standards outlined in RMC 4-6-060 Street Standards. Street lighting is required. Improvements that meet the street standards are required. *Staff Comment: Street improvements along Smithers Ave S and S 48th Pl. require a 53-foot wide right-of-way (a 55 foot ROW is shown on the plans). The proposed 28-foot wide road surface would allow on-street parking; 0.5 foot vertical curb; gutter; 8-foot wide landscape strip; and 5-foot wide sidewalk on both sides of the street.* *The primary access road, Smithers Ave, shall connect to S 48th Pl and be extended to the east to provide a second access from 102nd Ave SE. The completion of this street and its connection to 102nd Ave SE shall be a condition of project approval. The extended street, providing a second access to the proposed development, shall have construction completed prior to recording the final plat.* *The applicant has requested a street modification to RMC 4-6-060H "Dead End Streets" (see Section I, "Modification Request" above, and 9 "Fire" below).*
✓	**Relationship to Existing Uses:** The proposed project is compatible with existing surrounding uses. *Staff Comment: The properties surrounding the subject site are single-family residences and are designated R-8 on the City's zoning map. The proposal is similar to existing development patterns in the area and is consistent with the Comprehensive Plan and Zoning Code, which encourage residential infill development.*
9. AVAILABILITY AND IMPACT ON PUBLIC SERVICES:	
✓	**Police:** Service would be provided by the Renton Police Department. *Staff Comment: The Renton Police Department has commented that there would be minimal impacts from the project.*
Note 3	**Fire:** Service would be provided by the Renton Fire Department. *Staff Comment: Fire Prevention staff indicate that sufficient resources exist to furnish services to the proposed development; subject to the condition that the applicant provides Code required improvements and fees and that a second access be provided to the site in accordance with RMC 4-6-060H, which prohibits dead end streets longer than 700 feet in length. Such dead end streets, of which Smithers Ave S is one, require a second access to the development. (See Section I "Modification Request" above) Staff recommends as a condition of approval, a second access be constructed prior to recording the final plat.* *A Fire Impact Fee, based on the number of new single-family lots, is required to be paid prior to issuance of building permits, in order to mitigate the proposal's potential impacts to City emergency services. The fee is payable to the City as specified by the Renton Municipal Code. The 2014 Fire Impact Fee is $479.28 per new single-family residential unit.*
✓	**Schools:** The proposed project is located within the Renton School District. *Staff Comment: It is anticipated that the Renton School District can accommodate additional students generated by this proposal at the following schools: Benson Hill Elementary, Nelson Middle School, and Lindbergh High School.* *These schools are not within walking distance of the proposed development. Transportation would be required.* *A School Impact Fee, based on the number of new single-family lots, would be required in order to mitigate the proposal's potential impacts to Renton School District. The fee is payable to the City as specified by the Renton Municipal Code. The fee is assessed per single family residence. The 2014 fee for single-family residential units is $5,455.00 each.*

✓	**Parks:** The proposed project would add residents who may use City of Renton Parks and Recreation facilities. *Staff Comment: Although there would be no significant impacts to the City of Renton Park System anticipated from the proposed project, a Park Impact Fee is required of all new residential development. The Park Impact Fee shall be paid prior to building permit issuance. The 2014 Park Impact Fee is $963.01 per new single-family residence.*
✓	**Storm Water:** An adequate drainage system shall be provided for the proper drainage of all surface water. *Staff Comment: This 20 lot subdivision is required to comply with the 2009 King County Surface Water Manual and the 2009 City of Renton Amendments to the KCSWM, Chapter 1 and 2. Based on the City's flow control map, this site falls within the Flow Control Duration Standard, Forested Conditions. The site is subject to full drainage review. The Technical Information Report (TIR), Revised dated 7/15/2014, was submitted by D.R. Strong Consulting Engineers [Exhibit 11]. Additional reports [Exhibits 28-29] provided information about the proposed vault. The project is required to provide detention and water quality under the current King County Surface Water Manual. The engineer has provided a design for a combined detention and water quality vault to be located on Tract A of the site. A tightlined stormwater conveyance system shall be utilized to transport discharged stormwater from a vault to an existing system at the bottom of the protected slope (Tract F). A recorded easement agreement demonstrating access to the existing system shall be submitted prior to issuance of construction permits.* *A Construction Stormwater General Permit from Department of Ecology will be required for the grading and clearing of the site since it exceeds one acre.* *The surface water system development fee is $1,120.00 per lot. Fees are payable prior to issuance of the construction permit.*
✓	**Water:** The project would be served by the Soos Creek Water and Sewer District (SCWSD). *Staff Comment: The project proponent shall verify that the SCWSD is willing to provide water service to the development and the project proponent must obtain a certificate of water availability from SCWSD and provide it to the City prior to construction permit issuance. An extension of the SCWSD water main will be required and plans for the extension shall be reviewed and approved by both the SCWSD and the City of Renton. A water main improvements final plan, as approved by the SCWSD, shall be provided to the City. A separate agreement between the SCWSD and the City may be required prior to issuance of utility construction permits.* *Water main extension within the interior roads will be required to provide fire protection and domestic water services to all lots within the proposed plat. The number and location of the fire hydrants must be approved by Renton Fire Prevention Department.* *There shall be a minimum 10-foot separation between water lines and other utility lines.* *A Valley General Hospital – South Talbot Hill Water SAD fee may be applicable. This requirement would be required prior to issuance of construction permits.*
✓	**Sanitary Sewer:** The site is provided sanitary sewer service by the City of Renton. *Staff Comments: Sanitary sewer is provided by the City of Renton. Civil engineering plans will be prepared and submitted to the City for review and approval. Sewer main extension within the interior roads will be required along with a sewer stub for each lot within the proposed plat. In anticipation of development occurring to the east of the proposed project, staff recommends a condition of approval requiring an easement be recorded along the east property boundary for future extension of the sanitary sewer system. The easement shall be*

	at the time of recording the final plat. *There shall be a minimum 10-foot separation between sanitary sewer lines and other utility lines.* *Civil engineering plans for the sewer main extension must be approved by the District and a copy of the approved plans must be submitted to the City.* *A Sanitary Sewer System Development Fee (SDC) is required. It is based on the size of the domestic water meter. Current sanitary sewer fee for a ¾-inch or a 1-inch water meter is $1,812.00. These fees are assessed and payment is collected at the time of issuance of the construction permit.*
✓	**Transportation:** Impacts to the city transportation system are expected due to increased vehicle trips to and from the proposed project. *Staff Comments: Impacts from the development on the transportation system shall be mitigated by payment of Transportation Impact Fees. The 2014 Transportation Impact Fee rate is $1,430.72 per single family house. Payment of the transportation impact fee is due at the time of issuance of the building permit.*

L. RECOMMENDATIONS:

Staff recommends approval of the **Vuecrest Estates Preliminary Plat and Critical Areas Exemption**, as depicted in Exhibit 5, subject to the 8 conditions below. Staff recommends **denial** of the request for modification of RMC 4-6-060H (dead end road longer than 700 feet without a second access).

1. The applicant shall comply with nine the mitigation measures issued as part of the Determination of Non-Significance Mitigated, dated August 26, 2014 [Exhibit 14].
2. The applicant shall submit a detailed landscape plan, meeting all landscape plan submittal requirements of RMC 4-8-120L. The detailed landscape shall be submitted to and approved by the Current Planning Project Manager prior to issuance of construction permits. Street trees shall not include Callery Pear and trees on S. 48th Pl shall be a different type from those on Smithers Ave S.
3. The Replacement Tree Plan shall be revised to show the proposed locations for replanting 140 two-inch diameter replacement trees.
4. Vegetation (trees, shrubs, and ground cover) shall be planted to replace vegetation (trees, shrubs, and ground cover) removed for installation of the stormwater conveyance between the stormwater vault and the west property boundary of the property. Type and quantities shall be sufficient to ensure erosion control in the protected slope area.
5. The primary access road, Smithers Ave S, shall connect to S 48th Pl and be extended to the east to provide a second access from Main Ave S (102nd Ave SE) at its intersection with SE 186th St. The completion of this street and its connection to Main Ave S shall be a condition of project approval. The street type shall be determined by the City of Renton Fire Department. The extended street, providing a second access to the proposed development, shall have construction completed prior to recording the final plat.
6. A recorded easement agreement demonstrating access to the existing downslope stormwater control system shall be submitted prior to issuance of construction permits.
7. A Homeowners' Association shall be incorporated for maintenance and equal and undivided ownership of the tracts, the private access road, and the alley.
8. An easement shall be recorded along the east property boundary for future extension of the sanitary sewer system. The easement shall be at the time of recording the final plat.

EXPIRATION PERIODS:

Preliminary Plat Approval expires seven (7) years from the date of approval.

PROJECT NAME
VUECREST ESTATES

SE 1/4 SECTION 31, TOWNSHIP 23 N, RANGE 5 E, W.M..

VUECREST ESTATES

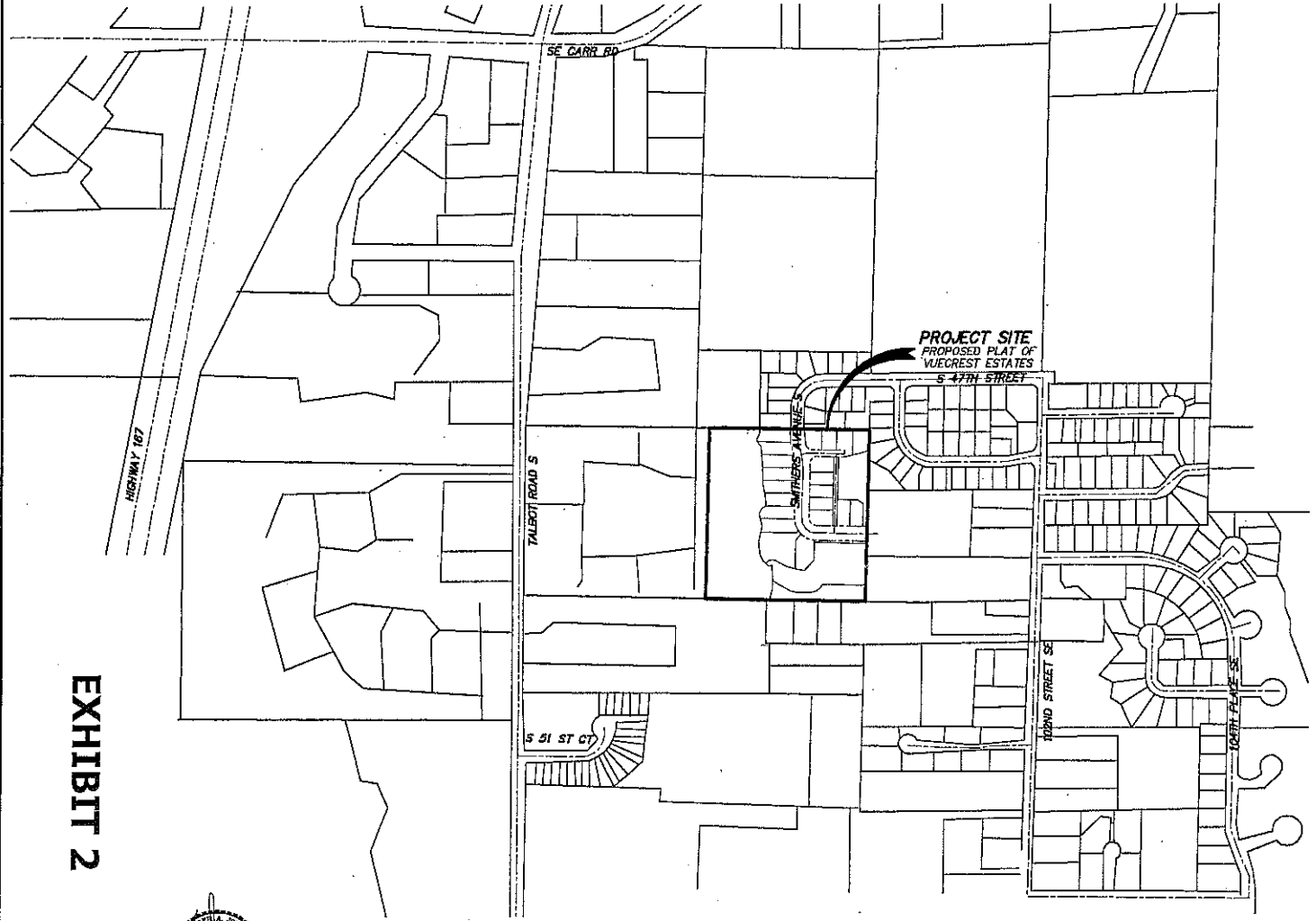


EXHIBIT 2

NOTE:
FEATURES SHOWN ON THIS MAP ARE ONLY APPROXIMATELY USING KING COUNTY MAP.

NORTH
GRAPHIC SCALE
0 100 200 400
1 INCH = 200 FT.

D.R. STRONG
CONSULTING ENGINEERS
SURVEYING PLANNING ENGINEERING

NO.	REVISION	BY	DATE	APPR
1	LOT, ROAD AND DRAINAGE REV	MW	07.15.14	MW

AS NOTED

CITY OF RENTON
Planning/Building/Public Works Dept.

VUECREST ESTATES
PRELIMINARY PLAT
NEIGHBORHOOD DETAIL MAP

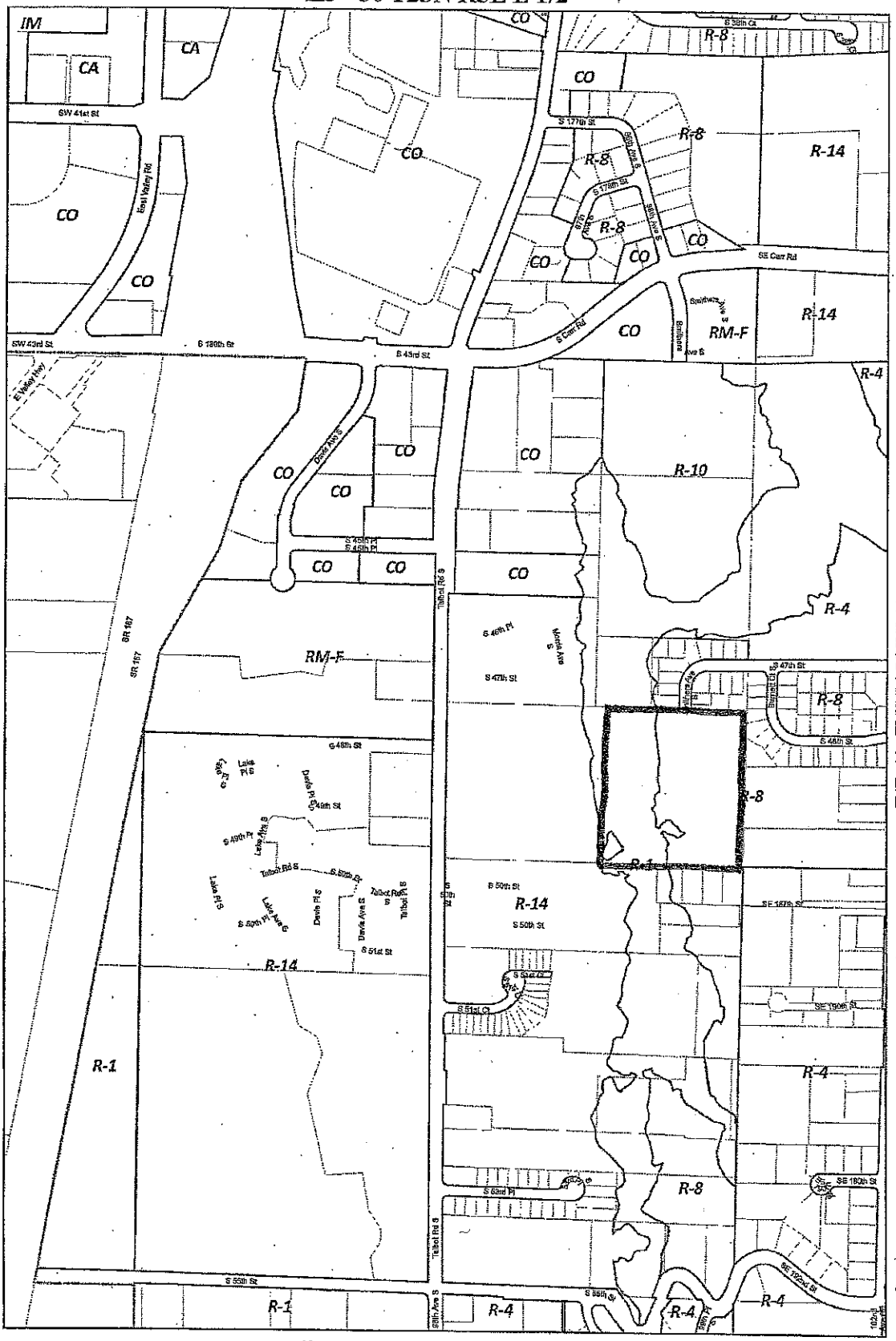
DATE 06.30.13
SCALE 1" = 200'
SHEET 1 OF 1

DRS PROJECT NO. 12102 LUA

H3 - 30 T23N R5E E 1/2

I3 - 31 T23N R5E W 1/2

I4 - 32 T23N R5E W 1/2



J3 - 06 T22N R5E E 1/2

ZONING MAP BOOK
PW TECHNICAL SERVICES
PRINTED ON 11/13/09

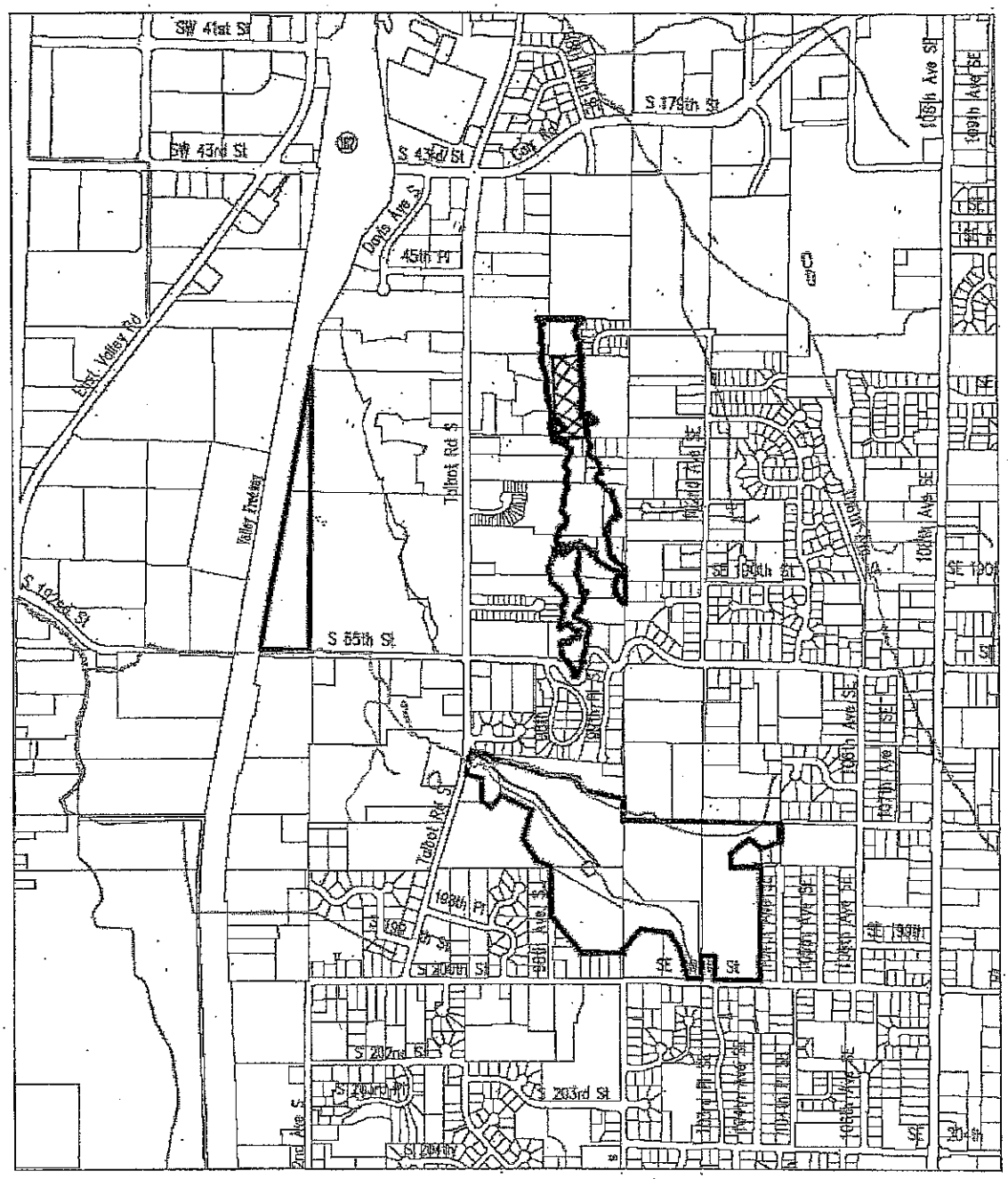
This document is a graphic representation, not guaranteed to survey accuracy, and is based on the best information available as of the date shown. This map is intended for City display purposes only.

City of Renton

0 200 400 Ft
1:4,800

EXHIBIT 3

2. **Talbot Urban Separator:**



Talbot Urban Separator

Economic Development, Neighborhoods & Strategic Planning
Alex Pietsch, Administrator
M. Del Rosario
19 December 2004

Renton City Limits
Urban Separator Boundary

(Ord. 5132, 4-4-2005)

EXHIBIT 4

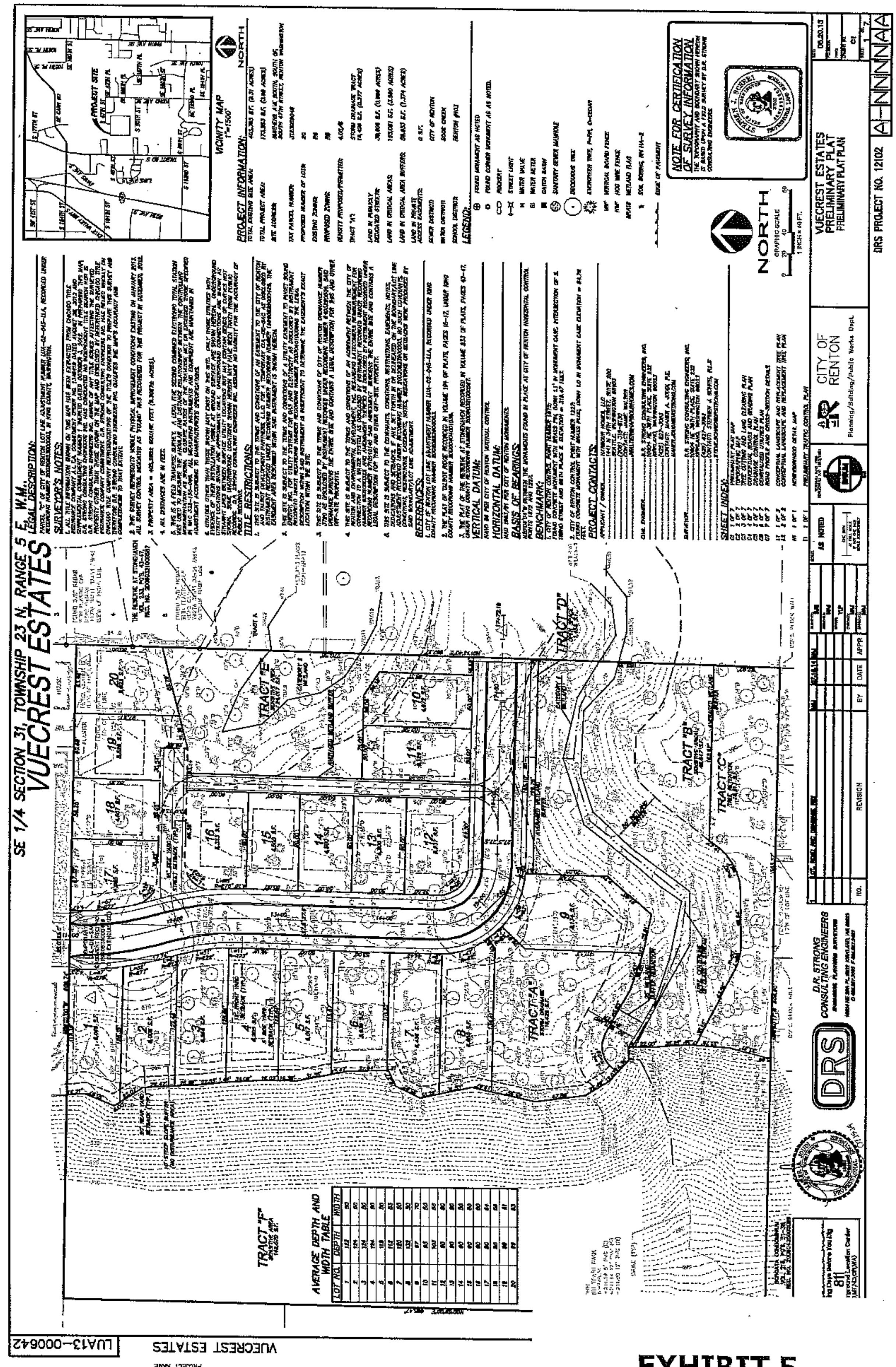

SE 1/4 SECTION 31, TOWNSHIP 23 N., RANGE 5 E., W.M.
VUECREST ESTATES
VUECREST ESTATES
PRELIMINARY PLAT
PRELIMINARY PLAT PLAN
DRS PROJECT NO. 12102
CITY OF RENTON
LUA13-000642
VUECREST ESTATES
PROJECT NAME

EXHIBIT 5

The Reserve at Stonehaven Homeowners Association

17701 108th Ave. SE, Box 434
Renton, WA 98055
reserveatstonehaven@gmail.com

Re: *Neighborhood Opposition Notification*
Vuecrest LUA 13-000642 / 4800 Block of Smithers Ave. S. / Parcel 3123059048

August 14, 2014

PUBLIC COMMENT
LETTERS
95 Pages

Entire Document
Available Upon Request

Ms. Elizabeth Higgins
Senior Planner, Department of Community & Economic Development
City of Renton
1055 S. Grady Way
Renton, WA 98057

Dear Ms. Higgins:

The Reserve at Stonehaven Homeowners Association, a community of 36 homeowners and taxpayers within Renton city limits continues to be strongly opposed to the application for, and approval of, the project named "Vuecrest Estates" – Land Use Number LUA 13-000642, ECF, PP – which was recently re-activated after a year on hold.

The project would be at the end of an already densely-developed dead-end one-way-out access road - jeopardizing the safety and security of our families and the property values of our homes.

It adds bottlenecks, traffic and noise as well as burdens on the water main systems -- with a potential flow rate which may not be sufficient for peak firefighting demand and puts at risk homeowners and the ability of fire and rescue response.

Finally, the project is in violation of wetlands protections and environmental common sense. The proposal is simply too large for an extremely sensitive environmental area.

We and our neighboring residents continue to request denial or *substantial limitation* of this development as currently proposed. We are requesting the following:

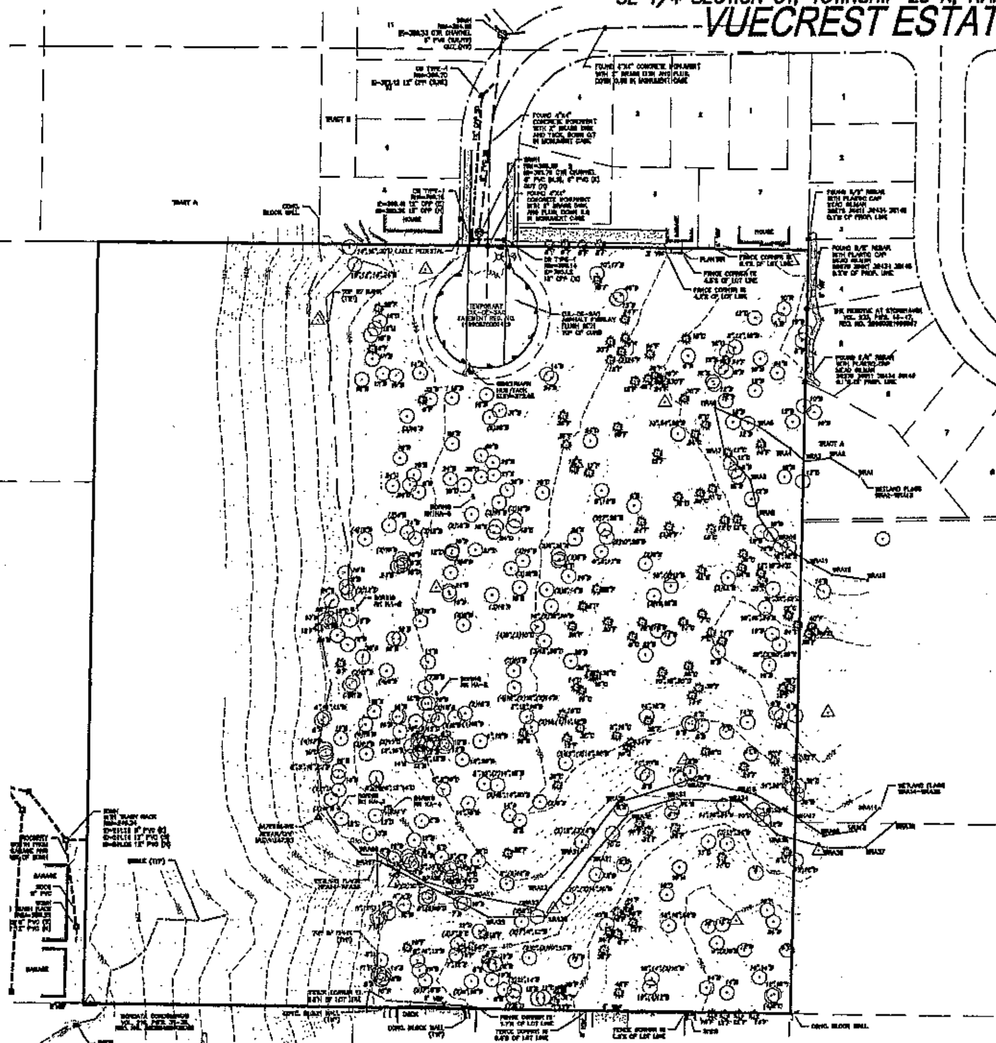
1. Denial of the project, or significant reduction to the scale of the project plan.
2. Denial of exceptions to distance limits for single street access for fire department response.
3. Denial of the application for Determination of Non-Significance-Mitigated (DNS-M). The impact continues to be significant and is still not mitigated in the current proposal.
4. Reduction by at least five additional home sites which are violating critical areas and wetlands-- and needs significantly greater retention of trees and wildlife habitat.
5. Greatly increased scope of buffer protection around critical wetland and stream areas.
6. Detailed plans to mitigate traffic, parking, safety and access issues.
7. Detailed plans to assure safe fire/rescue and water main capacity which may be at current limits

EXHIBIT 6

LUA13-000642

PROJECT NAME: VUECREST ESTATES

SE 1/4 SECTION 31, TOWNSHIP 23 N, RANGE 5 E, W.M.
VUECREST ESTATES



LEGEND:

- FOUND MONUMENT AS NOTED
- FOUND CORNER MONUMENT AS AS NOTED
- ROCKERY
- STREET LIGHT
- WATER VALVE
- WATER METER
- CATCH BASIN
- SANITARY SEWER MANHOLE
- DECIDUOUS TREE
- EVERGREEN TREE, FWFR, C=CEDAR
- VBF VERTICAL BOARD FENCE
- HWF HOG WIRE FENCE
- WAA18 WETLAND FLAG
- SOIL BORING, PN HA-1
- EDGE OF PAVEMENT

LEGAL DESCRIPTION:

PARCEL "C" OF CITY OF RENTON LOT LINE ADJUSTMENT NUMBER LUA-02-045-LLA, RECORDED UNDER RECORDING NUMBER [illegible], IN KING COUNTY, WASHINGTON.

SURVEYOR'S NOTES:

1. ALL TITLE INFORMATION SHOWN ON THIS MAP HAS BEEN EXTRACTED FROM CHICAGO TITLE INSURANCE COMPANY A.L.T.A. COMMITMENT ORDER NO. [illegible] DATED AUGUST 28, 2012 AND SUPPLEMENTAL COMMITMENT NUMBER 1 THERETO DATED OCTOBER 3, 2012. IN PREPARING THIS MAP, D.R. STRONG CONSULTING ENGINEERS INC. HAS CONDUCTED NO INDEPENDENT TITLE SEARCH NOR IS D.R. STRONG CONSULTING ENGINEERS INC. AWARE OF ANY TITLE ISSUES AFFECTING THE SURVEYED PROPERTY OTHER THAN THOSE SHOWN ON THE MAP AND DISCLOSED BY REFERENCED CHICAGO TITLE INSURANCE COMPANY COMMITMENT. D.R. STRONG CONSULTING ENGINEERS INC. HAS RELIED WHOLLY ON CHICAGO TITLE COMPANY REPRESENTATIONS OF THE TITLE'S CONDITION TO PREPARE THIS SURVEY AND THEREFORE D.R. STRONG CONSULTING ENGINEERS INC. QUALIFIES THE MAP'S ACCURACY AND COMPLETENESS TO THAT EXTENT.

2. THIS SURVEY REPRESENTS VISIBLE PHYSICAL IMPROVEMENT CONDITIONS EXISTING ON JANUARY 2013. ALL SURVEY CONTROL INDICATED AS "FOUND" WAS RECOVERED FOR THIS PROJECT IN DECEMBER, 2012.

3. PROPERTY AREA = 405,308± SQUARE FEET (9.3047± ACRES).

4. ALL DISTANCES ARE IN FEET.

5. THIS IS A FIELD TRAVERSE SURVEY. A LEICA FIVE SECOND COMBINED ELECTRONIC TOTAL STATION WAS USED TO MEASURE THE ANGULAR AND DISTANCE RELATIONSHIPS BETWEEN THE CONTROLLING MONUMENTATION AS SHOWN. CLOSURE RATIOS OF THE TRAVERSE MET OR EXCEEDED THOSE SPECIFIED IN WAC 332-130-090. ALL MEASURING INSTRUMENTS AND EQUIPMENT ARE MAINTAINED IN ADJUSTMENT ACCORDING TO MANUFACTURER'S SPECIFICATIONS.

6. UTILITIES OTHER THAN THOSE SHOWN MAY EXIST ON THIS SITE. ONLY THOSE UTILITIES WITH EVIDENCE OF THEIR INSTALLATION VISIBLE AT GROUND SURFACE ARE SHOWN HEREON. UNDERGROUND UTILITY LOCATIONS SHOWN ARE APPROXIMATE ONLY. UNDERGROUND CONNECTIONS ARE SHOWN AS STRAIGHT LINES BETWEEN SURFACE UTILITY LOCATIONS BUT MAY CONTAIN BENDS OR CURVES NOT SHOWN. SOME UNDERGROUND LOCATIONS SHOWN HEREON MAY HAVE BEEN TAKEN FROM PUBLIC RECORDS. D.R. STRONG CONSULTING ENGINEERS INC. ASSUMES NO LIABILITY FOR THE ACCURACY OF PUBLIC RECORDS.

RESTRICTIONS:

1. [illegible]

2. [illegible]

3. [illegible]

4. [illegible] SET FORTH IN OR DELINEATED ON THE BOUNDARY/LOT LINE ADJUSTMENT RECORDED UNDER RECORDING NUMBER 20020823900003.

REFERENCES:

1. CITY OF RENTON LOT LINE ADJUSTMENT NUMBER LUA-02-045-LLA, RECORDED UNDER KING COUNTY RECORDING NUMBER 20020823900003.

2. THE PLAT OF TALBOT RIDGE RECORDED IN VOLUME 194 OF PLATS, PAGES 15-17, UNDER KING COUNTY RECORDING NUMBER 20000404001008.

3. THE PLAT OF THE RESERVE AT STONEHAVEN RECORDED IN VOLUME 233 OF PLATS, PAGES 43-47, UNDER KING COUNTY RECORDING NUMBER 20060321000587.

VERTICAL DATUM:

NAVD 88 PER CITY OF RENTON VERTICAL CONTROL.

BENCHMARK:

1. CITY OF RENTON CONTROL POINT NUMBER 1872:
FOUND CONCRETE MONUMENT WITH BRASS PIN, DOWN 1.1' IN MONUMENT CASE. INTERSECTION OF S. 192ND STREET AND 88TH PLACE S. ELEVATION = 318.47 FEET.

2. CITY OF RENTON CONTROL POINT NUMBER 1227:
FOUND CONCRETE MONUMENT WITH BRASS PLUG, DOWN 1.0 IN MONUMENT CASE ELEVATION = 54.76 FEET.

HORIZONTAL DATUM:

NAD 1983/91 PER CITY OF RENTON MONUMENTS.

BASIS OF BEARINGS:

N20°08'04"W BETWEEN THE MONUMENTS FOUND IN PLACE AT CITY OF RENTON HORIZONTAL CONTROL POINTS 1472 AND 1227.

NORTH

GRAPHIC SCALE 0 25 50 100
1 INCH = 50 FT.

NOTE FOR CERTIFICATION OF SURVEY INFORMATION
THE TOPOGRAPHY AND BOUNDARY SHOWN HEREON IS BASED UPON A FIELD SURVEY BY D.R. STRONG CONSULTING ENGINEERS.

STEPHEN J. SCHREI — STATE OF WASHINGTON — REGISTERED PROFESSIONAL LAND SURVEYOR

Working Days Before You Dig — 811 — Underground Location Center (ID,MT,ND,OR,WA)

D.R. STRONG CONSULTING ENGINEERS
ENGINEERS PLANNERS SURVEYORS

NO.	REVISION	BY	DATE	APPR
1	LOT, ROAD AND DRAINAGE REV	MAJ	07.16.14	MAJ

SCALE: AS NOTED

CITY OF RENTON — Planning/Building/Public Works Dept.

VUECREST ESTATES
PRELIMINARY PLAT
TOPOGRAPHY MAP

DATE: 06.20.13

02

DRS PROJECT NO. 12102

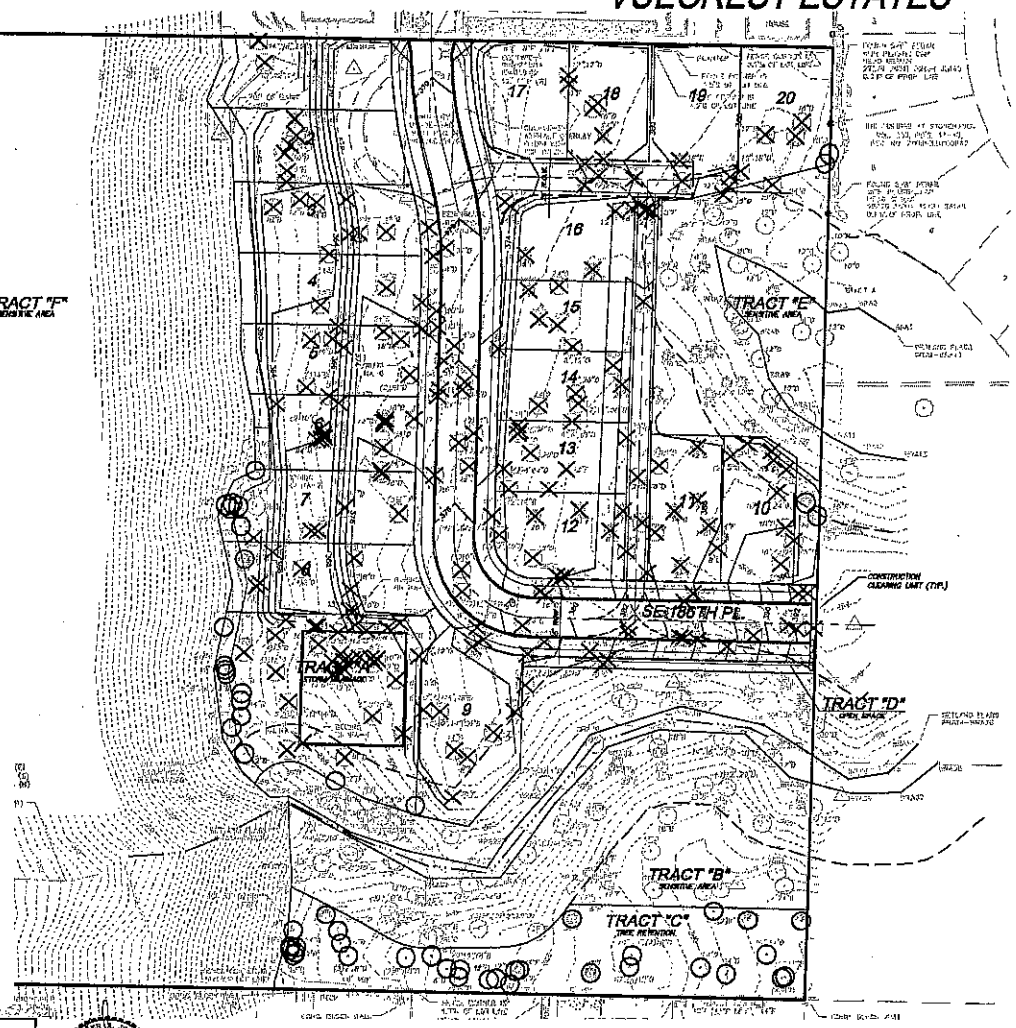
EXHIBIT 7

PROJECT NAME
VUECREST ESTATES

LUA13-000642

SE 1/4 SECTION 31, TOWNSHIP 23 N, RANGE 5 E, W.M..

VUECREST ESTATES



TREE RETENTION CALCULATIONS	
TOTAL TREES ON SITE:	401
EXCLUDED TREES:	0
TREES IN RIGHT-OF-WAY:	67
TREES IN PRIVATE ACCESS EASEMENTS/TRACTS:	13
TREES IN CRITICAL AREAS AND BUFFERS:	132
NET TREES:	309
TREES TO BE RETAINED, REQUIRED:	(309 X 0.3) = 92.7
TREES TO BE RETAINED, PROPOSED:	94
REQUIRED MINIMUM REPLACEMENT RATIO:	104.4

REPLACEMENT TREES WILL CONSIST OF MINIMUM 2" CALIPER TREES.

TESC LEGEND
CONSTRUCTION LIMITS & HIGH VISIBILITY PLASTIC CONSTRUCTION FENCE.
TREES TO BE REMOVED
TREES TO BE SAVED (94)

EXHIBIT 8

NORTH

GRAPHIC SCALE
0 20 40 80
1 INCH = 40 FT.

Call 2 Working Days Before You Dig
811
Utilities Underground Location Center
(WASHINGTON, OREGON, WA)

D.R. STRONG CONSULTING ENGINEERS

NO.	REVISION	BY	DATE	APPR
1	LOT, ROAD AND DRAINAGE REV	MM	07.18.14	MM

SCALE: AS NOTED

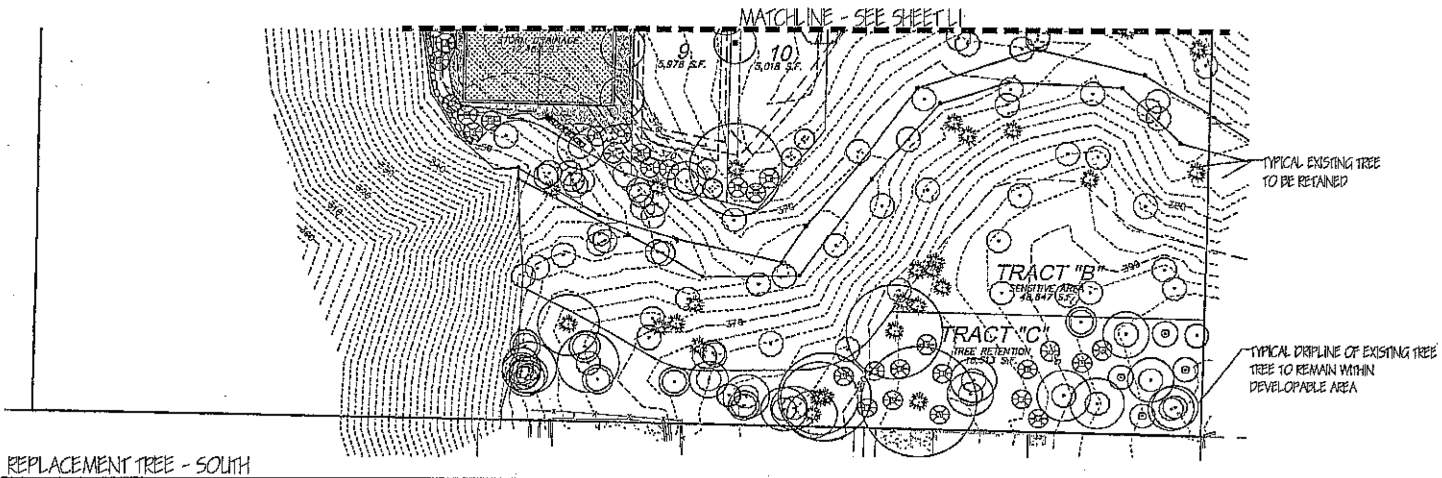
CITY OF RENTON
Planning/Building/Public Works Dept.

VUECREST ESTATES
PRELIMINARY PLAT
TREE CUTTING AND LAND CLEARING PLAN

DATE: 06.20.13
DRAWN BY: MM
CHECKED BY: DJ
SHEET: 3 OF 7

DRS PROJECT NO. 12102

A-NNNNAA



REPLACEMENT TREE - SOUTH

SCALE 1"-30'

LANDSCAPE NOTES

1. CONTRACTOR SHALL BE RESPONSIBLE FOR FAMILIARIZING THEMSELVES WITH ALL OTHER SITE IMPROVEMENTS AND CONDITIONS PRIOR TO STARTING LANDSCAPE WORK.
2. CONTRACTOR SHALL USE CAUTION WHILE EXCAVATING TO AVOID DISTURBING ANY UTILITIES ENCOUNTERED. CONTRACTOR IS TO PROMPTLY ADVISE OWNER OF ANY DISTURBED UTILITIES. LOCATION SERVICE PHONE 1-800-424-5555
3. CONTRACTOR SHALL MAINTAIN AND WATER ALL PLANT MATERIAL FOR 1 YEAR OR UNTIL FINAL INSPECTION AND ACCEPTANCE BY OWNER.
4. CONTRACTOR SHALL BE RESPONSIBLE FOR COMPUTING SPECIFIC QUANTITIES OF GROUND COVERS AND PLANT MATERIALS UTILIZING ON-CENTER SPACING FOR PLANTS AS STATED ON THE LANDSCAPE PLAN AND MINIMUM PLANTING DISTANCES AS SPECIFIED BELOW IN THESE NOTES.
5. CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING THE QUANTITIES OF PLANTS THAT ARE REPRESENTED BY SYMBOLS ON THE DRAWINGS.
6. SUBGRADE IS TO BE WITHIN 1/10" OF ONE FOOT AS PROVIDED BY OTHERS. ALL PLANTING AREAS TO BE CLEARED OF ALL CONSTRUCTION MATERIAL AND ROCKS AND STICKS LARGER THAN 2" DIAMETER.
7. 4" DEPTH NEW TOPSOIL IN NEW BEDS SHOWN. ROTOTILL INTO TOP 6" OF SOIL.
8. ALL BEDS TO RECEIVE A MINIMUM OF 2" FINE FIR BARK.
9. ALL PLANT MATERIAL SHALL BE FERTILIZED WITH AGRO TRANSPLANT FERTILIZER 4-2-2 PER MANUFACTURER'S SPECIFICATIONS.
10. ALL PLANT MATERIAL SHALL CONFORM TO AAN STANDARDS FOR NURSERY STOCK, LATEST EDITION. ANY REPLACEMENTS MADE AT ONCE.
    A. GENERAL: ALL PLANT MATERIAL FURNISHED SHALL BE HEALTHY REPRESENTATIVES, TYPICAL OF THEIR SPECIES OF VARIETY AND SHALL HAVE A NORMAL GROWTH HABIT. THEY SHALL BE FULL, WELL BRANCHED, WELL PROPORTIONED, AND HAVE A VIGOROUS, WELL DEVELOPED ROOT SYSTEM. ALL PLANTS SHALL BE HARDY UNDER CLIMATIC CONDITIONS SIMILAR TO THOSE IN THE LOCALITY OF THE PROJECT.
    B. TREES, SHRUBS, AND GROUND COVER: QUANTITIES, SPECIES, AND VARIETIES, SIZES AND CONDITIONS AS ON THE PLANTING PLAN. PLANTS TO BE HEALTHY, VIGOROUS, WELL FOLIATED WHEN IN LEAF. FREE OF INJURY, INSECTS, DECAY, HARMFUL DEFECTS, AND ALL WEEDS. NO SUBSTITUTIONS SHALL ITHOUT WRITTEN APPROVAL FROM LANDSCAPE ARCHITECT OR OWNER.

    IRRIGATION SYSTEM IS PROPOSED. TREES LOCATED ON THE PROPOSED LOTS WILL BE IRRIGATED BY FUTURE LANDSCAPE STRIP PLANT MATERIAL IS CONSIDERED 100% DROUGHT TOLERANT AND SHALL BE PROVIDED TEMPORARY THE FIRST TWO (2) YEARS.

    SHALL BE RESPONSIBLE FOR INSTALLING PROPOSED LOT TREES UPON COMPLETION OF THE PROPOSED HOMES. LANT MATERIAL SHALL BE INSTALLED BY DEVELOPER.

REPLACEMENT TREE PLANT SCHEDULE

BOTANICAL NAME	COMMON NAME	QUANTITY	SIZE	REMARKS
TREES				
Pyrus calleryana 'Redspire'	Flowering Pear	52	2" cal	Full and Matching
Quercus palustris	Pin Oak	4	2" cal	Full and Matching
Pseudotsuga menziesii	Douglas Fir	30	2" cal	Full and Matching
Thuja plicata	Western Red Cedar	46	2" cal	Full and Matching
Acer circinatum	Vine Maple	24	2" cal	Full and Matching
Acer macrophyllum	Big Leaf Maple	4	2" cal	Full and Matching
		TOTAL 140		

SEE CONCEPTUAL LANDSCAPE PLAN THIS SET FOR REPLACEMENT TREE LOCATIONS

YARD TREE PLANT SCHEDULE

BOTANICAL NAME	COMMON NAME	QTY	SIZE	REMARKS
TREES				
Betula jacquemontii*	Jacquemontii Birch	11	2" cal	Full and Matching
Acer freemanii 'Autumn Blaze'*	Maple	7	2" cal	Full and Matching
Styrax japonica*	Flowering Pear	13	2" cal	Full and Matching
Acer palmatum 'Bloodgood'*	Japanese Maple	11	6' ht.	Full and Matching

21 TOTAL LOTS X 2 TREES/ LOT MINIMUM = 42 TREES REQUIRED 42 TREES PROVIDED

* Considered drought tolerant in Pacific Northwest once established

STREETSCAPE BUFFER PLANT SCHEDULE

Mixture of deciduous and evergreen drought-tolerant shrubs. Species, quantities and sizes to be determined

Lawn

PLANT SCHEDULE

Mixture of deciduous and evergreen drought-tolerant shrubs native to the Pacific Northwest. Species, quantities and sizes to be determined

NORTH

0 30 60 90

22"x34" SHEET SIZE

EXHIBIT 9

REVISIONS			
NO.	DATE	DESCRIPTION	BY
1	05.07.13	ADD'L TREE DATA	JMV

DRAWING DATE 04.21.13

STATE OF WASHINGTON REGISTERED LANDSCAPE ARCHITECT
JEFF M. VARLEY CERTIFICATE No. 774

VARLEY • VARLEY • VARLEY
JEFF VARLEY landscape architect
www.varleylandscape.com

HARBOUR HOMES, LLC
VUECREST ESTATES
CONCEPTUAL LANDSCAPE and REPLACEMENT TREE PLAN

JOB NUMBER:	
DRAWING NAME:	
DESIGNER:	JMV
DRAFTING BY:	JMV
DATE:	04-21-13
SCALE:	AS SHOWN
JURISDICTION:	RENTON

L-2
SHEET 2 of 2

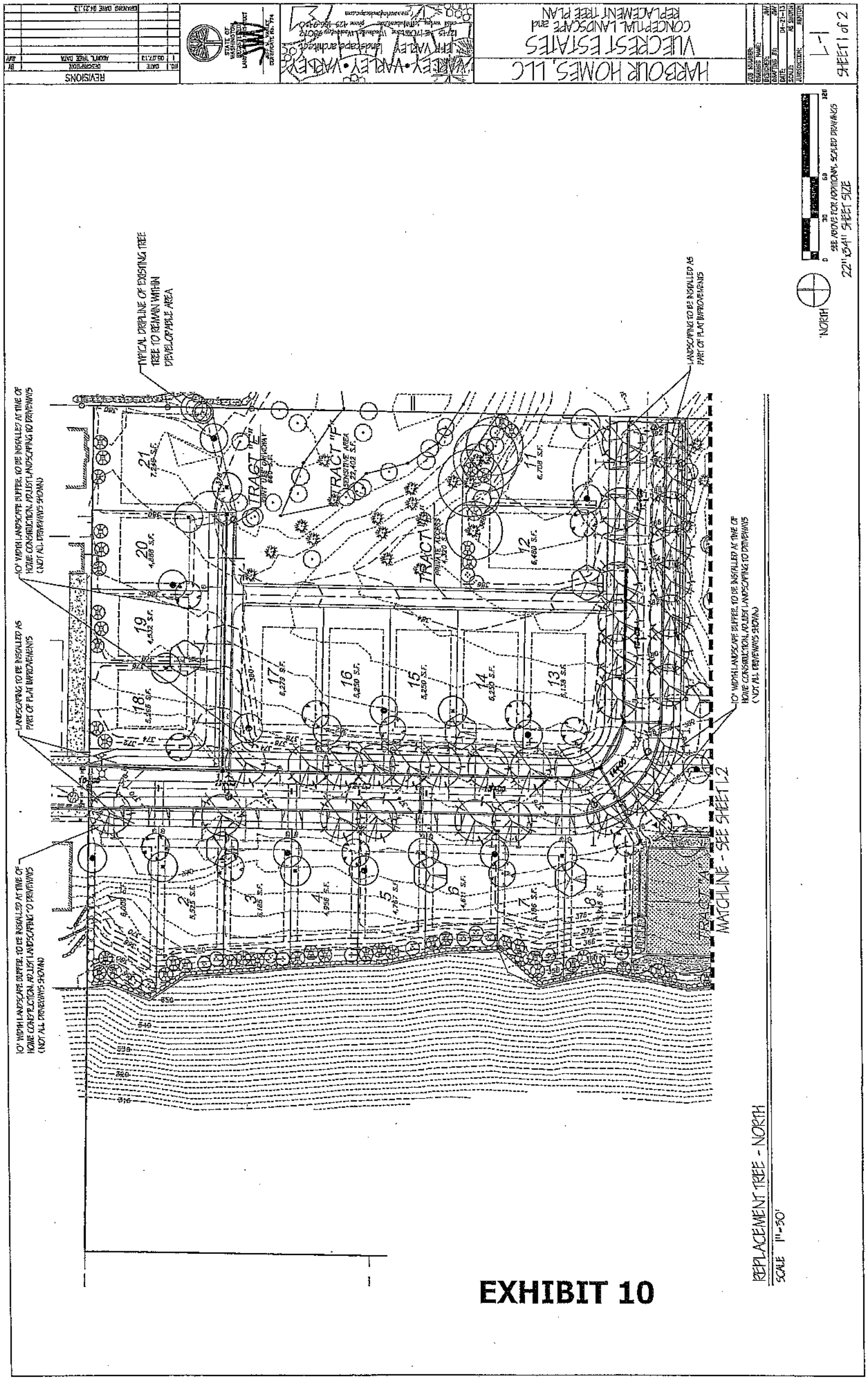

HARBOUR HOMES, LLC
VUECREST ESTATES
CONCEPTUAL LANDSCAPE and REPLACEMENT TREE PLAN
REVISIONS
L-1
SHEET 1 of 2
REPLACEMENT TREE - NORTH
SCALE 1"=30'
MATCHLINE - SEE SHEET L2
TRACT "E"
TRACT "F"
TRACT "A"
NORTH
22"x34" SHEET SIZE

EXHIBIT 10

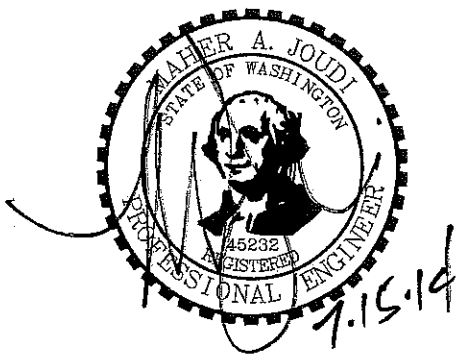
TECHNICAL INFORMATION REPORT

for

VUECREST ESTATES

Preliminary Plat

4800 Block of Smithers Avenue S in Renton, Washington



DRS Project No. 12102
Renton File No. LUA13-000642

Owner/Applicant

Harbour Homes, LLC
1441 North 34th Street, Suite 200
Seattle, WA 98103

Report Prepared by

D. R. STRONG Consulting Engineers, Inc.
10604 N.E. 38th Place, Suite 232
Kirkland WA 98033
(425) 827-3063

Report Issue Date

May 21, 2013

Report Revision Issue Date

July 15, 2014

Entire Document
Available Upon Request

EXHIBIT 11

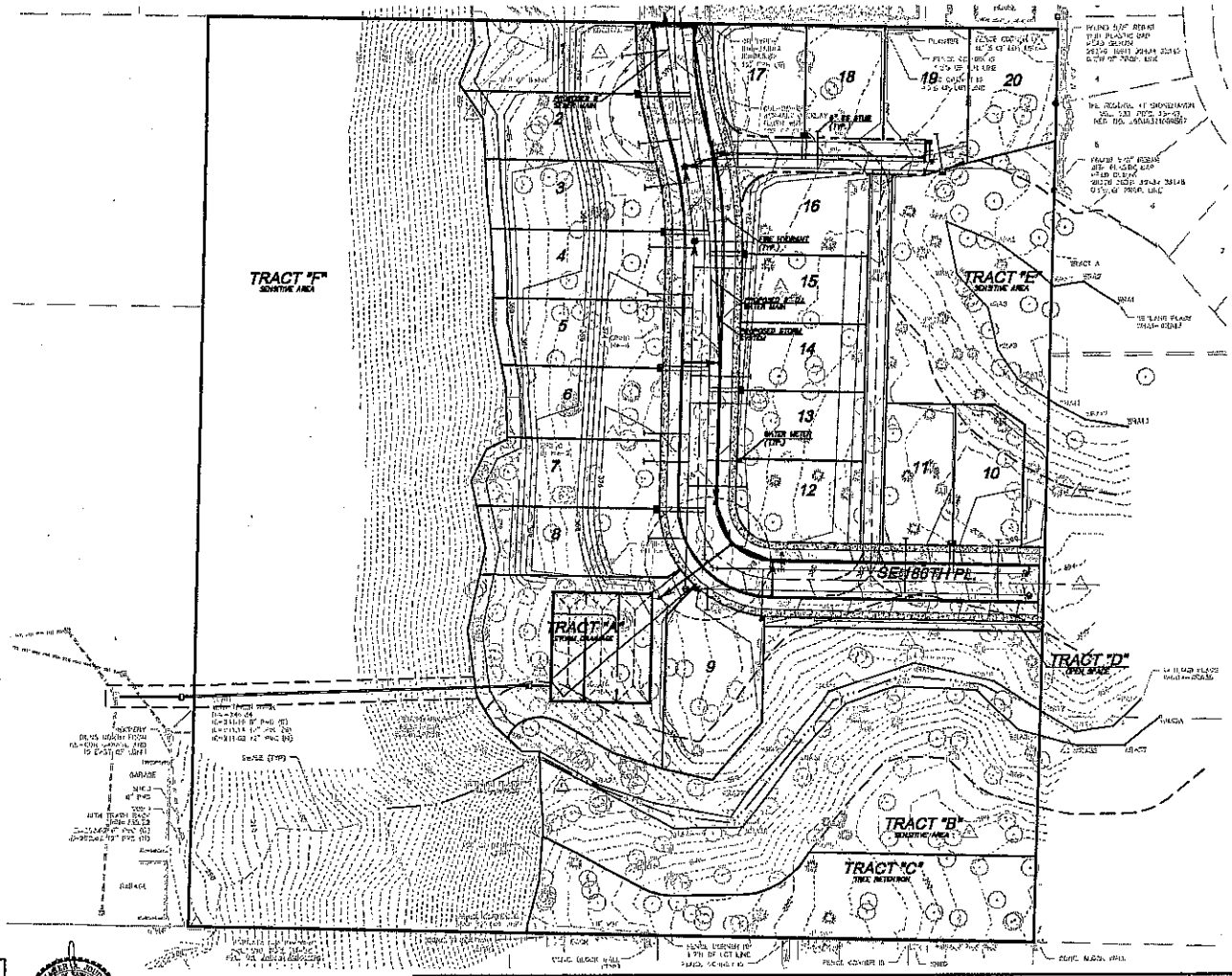
PROJECT NAME
VUECREST ESTATES

LUA13-000642

EXHIBIT 12

SE 1/4 SECTION 31, TOWNSHIP 23 N, RANGE 5 E, W.M..

VUECREST ESTATES



NORTH
GRAPHIC SCALE
0 20 40 80
1 INCH = 40 FT.

D.R. STRONG CONSULTING ENGINEERS
PLANNERS SURVEYORS

NO.	REVISION	BY	DATE	APPR
1	LOT, ROAD AND DRAINAGE REV	MM	07.18.14	MM

AS NOTED

CITY OF RENTON
Planning/Building/Public Works Dept.

VUECREST ESTATES
PRELIMINARY PLAT
GENERALIZED UTILITIES PLAN

08.20.13
C6

DRS PROJECT NO. 12102

A-NNNNAA

DEPARTMENT OF COMMUNITY AND ECONOMIC DEVELOPMENT

City of Renton

ENVIRONMENTAL (SEPA) DETERMINATION OF NON-SIGNIFICANCE - MITIGATED (DNS-M)

PROJECT NUMBER: LUA13-000642

APPLICANT: Jamie Waltier, Harbour Homes

PROJECT NAME: Vuecrest Estates

PROJECT DESCRIPTION: The project proponent has submitted an application for a Preliminary Plat subdivision, which requires an environmental review by the City of Renton Environmental Review Committee. If approved, the project would result in the subdivision of a 6.06 acre property, located in the Talbot planning area of the City, into 21 20 lots suitable for single-family residential use. The property has Comprehensive Plan designations of Residential Low Density, Residential Single-Family, and Residential Medium Density and is corespondlingly zoned Residntial 1, Residential 8, and Residential 14. The west approximately one-third of the property is within the Talbot Urban Separator and is subject to City of Renton Urban Separator Overlay Regulations. The project site is currently undeveloped.

PROJECT LOCATION: 4800 BLOCK OF SMITHERS AVENUE S

LEAD AGENCY: City of Renton
Environmental Review Committee
Department of Community & Economic Development

The City of Renton Environmental Review Committee has determined that it does not have a probable significant adverse impact on the environment. An Environmental Impact Statement (EIS) is not required under RCW 43.21C.030(2)(c). Conditions were imposed as mitigation measures by the Environmental Review Committee under their authority of Section 4-9-070D Renton Municipal Code. These conditions are necessary to mitigate environmental impacts identified during the environmental review process. Because other agencies of jurisdiction may be involved, the lead agency will not act on this proposal for fourteen (14) days.

Appeals of the environmental determination must be filed in writing on or before 5:00 p.m. on September 12, 2014. Appeals must be filed in writing together with the required fee with: Hearing Examiner, City of Renton, 1055 South Grady Way, Renton, WA 98057. Appeals to the Examiner are governed by RMC 4-8-110 and more information may be obtained from the Renton City Clerk's Office, (425) 430-6510.

PUBLICATION DATE: **August 29, 2014**

EXHIBIT 13

DATE OF DECISION: AUGUST 26, 2014

SIGNATURES:

Gregg Zimmerman, Administrator
Public Works Department — Date: 8/26/14

Mark Peterson, Administrator
Fire & Emergency Services — Date: 8/26/14

Terry Higashiyama, Administrator
Community Services Department — Date: 8/26/14

C.E. "Chip" Vincent, Administrator
Department of Community & Economic Development — Date: 8/26/14

DEPARTMENT OF COMMUNITY AND ECONOMIC DEVELOPMENT

City of Renton

DETERMINATION OF NON-SIGNIFICANCE-MITIGATED (DNSM) MITIGATION MEASURES

PROJECT NUMBER: LUA13-000642, ECF, PP

APPLICANT: Jamie Waltier, Harbour Homes

PROJECT NAME: Vuecrest Estates Preliminary Plat

PROJECT DESCRIPTION: The project proponent has submitted an application for a Preliminary Plat subdivision, which requires an environmental review by the City of Renton Environmental Review Committee. If approved, the project would result in the subdivision of a 6.06 acre property, located in the Talbot planning area of the City, into ~~21~~ 20 lots suitable for single-family residential use. The property has Comprehensive Plan designations of Residential Low Density, Residential Single-Family, and Residential Medium Density and is correspondlingly zoned Residntial 1, Residential 8, and Residential 14. The west approximately one-third of the property is within the Talbot Urban Separator and is subject to City of Renton Urban Separator Overlay Regulations. The project site is currently undeveloped.

PROJECT LOCATION: 4800 block of Smithers Avenue S

LEAD AGENCY: The City of Renton
Department of Community & Economic Development
Planning Division

MITIGATION MEASURES:

1. Recommendations regarding site preparation, grading, excavation, and slab-on-grade construction included in the report, "Geotechnical Engineering Study, Proposed Smithers Ave Residential Plat...," dated February 25, 2013, by Earth Solutions NW, LLC, shall be followed prior to and during construction.
2. The area west from the line marking the natural top of the protected slope to the west property boundary, between the north and south property lines, shall be designated Native Growth Protection Area 'A'.
3. A Homeowners' Association (HOA) shall be incorporated and the responsibility for maintenance of Native Growth Protection Area 'A' shall be assigned to the HOA on the face of the plat prior to recording.
4. Building permits shall be issued, prior to construction, for any retaining walls at the project, regardless of site location and height, and all such walls shall be structural.
5. Building setbacks from the north-south top-of-slope line located west of Smithers Ave S shall be made a condition of approval of the preliminary plat. Furthermore, the top of slope and the building slope setback line shall be indicated on the final plat map.

EXHIBIT 14

6. Easements required to accommodate the conveyance of surface water from the project site to the area-wide, downstream system shall be finalize prior to issuance of utility and site construction permits.
7. A wetland and buffer monitoring plan shall be approved prior to issuance of utility and road construction permits and shall be initiated prior to recording the plat. A bond, meeting the requirements of the Renton Municipal Code, shall be required for the monitoring period of no less than 5 years.
8. Native Growth Protection Easements 'B' and 'C' shall be protected and maintained by the Homeowners' Association in accordance with Renton Municipal Code requirements. This responsibility shall be recorded on the face of the plat.
9. Critical Area Study and Supplemental Stream Study shall be revised to remove the stream from plans where it is shown within the wetland, revising the stream description and its linear dimensions accordingly. Such revisions shall be made prior to recording the Final Plat.

DEPARTMENT OF COMMUNITY AND ECONOMIC DEVELOPMENT

City of Renton

M E M O R A N D U M

DATE:	June 20, 2013
TO:	Elizabeth Higgins
FROM:	Bob Mac Onie
SUBJECT:	**Vuecrest PP, LUA13-000642** **Format and Legal Description Review**

I have reviewed the above referenced final plat submittal and have the following comments:

There is a substantial and long standing encroachment over the southwesterly portion of proposed Tract 'C'. This issue needs to be remedied prior to final plat approval.

Note the City of Renton land use action number and land record number, LUA13-000642 and LND-10-0501, respectively, on the final plat submittal. The type size used for the land record number should be smaller than that used for the land use action number. *Please note that the land use action number provided will change when this subdivision changes from preliminary to final plat status.*

Show two ties to the City of Renton Survey Control Network. The geometry will be checked by the city when the ties have been provided.

Provide sufficient information to determine how the plat boundary was established.

Include a statement of equipment and procedures used, per WAC32-130-100.

Note the date the existing city monuments were visited and what was found, per WAC 332-130-150.

Provide lot closure calculations.

Indicate what has been, or is to be, set at the corners of the proposed lots.

Note discrepancies between bearings and distances of record and those measured or calculated, if any.

EXHIBIT 15

The lot addresses will be provided by the city as soon as possible. Note said addresses and the street name on the plat drawing.

On the final plat submittal, remove all references pertaining to utilities facilities, trees, concrete, gravel, decks and other items not directly impacting the subdivision. These items are provided only for preliminary plat approval.

Do note encroachments.

Remove from the "LEGEND" block all tree items, utilities facilities and mailbox references, but do include in said "LEGEND" block the symbols and their details that are used in the plat drawing.

Do not include a utility provider's block, an owner's block, an engineer/surveyor block and an architect block.

Do not include any references to use, density or zoning on the final submittal

If the abutting properties are platted, note the lot numbers and plat name on the drawing otherwise note them as 'Unplatted'.

Remove the building setback lines from the proposed lots. Setbacks will be determined at the time that building permits are issued.

Note the research resources on the plat submittal.

Note all easements, covenants and agreements of record on the plat drawing.

The City of Renton "APPROVALS" blocks for the City of Renton Administrator, Public Works Department, the Mayor, City Clerk and the Finance Director .

A pertinent approval block is also needed for the King County Assessor's Office. Provide signature lines as required.

Remove references to density and zoning information on the final plat drawing.

If there is a Restrictive Covenants, Conditions & Restrictions document for this plat, then reference the same on the plat drawing and provide a space for the recording number thereof.

Note that if there are restrictive covenants, agreements or easements to others (neighboring property owners, etc.) as part of this subdivision, they can be recorded concurrently with the plat. The plat drawings and the associated document(s) are to be

given to the Project Manager as a package. The plat document will be recorded first (with King County). The recording number(s) for the associated document(s) (said documents recorded concurrently with, but following the plat) need to be referenced on the plat drawings.

Please provide a label, e.g. Tract 'G' for the balance of the parcel being subdivided.

Provide appropriate conveying language for the Tracts created.

For those belong to the HOA:

> Upon the recording of this plat, Tract(s whatever) is/are hereby granted and conveyed to the *Plat of Name of Plat* Homeowners' Association (HOA). In the event that the HOA is dissolved or otherwise fails to meet its property tax obligations, as evidenced by non-payment of property taxes for a period of eighteen (18) months, then each lot in this plat shall assume and have an equal and undivided ownership interest in the Tract(s) previously owned by the HOA and have the attendant financial and maintenance responsibilities.

Otherwise, use the following language on the final plat drawing:

> Lots 1 through 20, inclusive, shall have an equal and undivided ownership interest in Tract(s whatever).

The foregoing statements are to be accompanied by language defining the maintenance responsibilities for any infrastructure located on the Tract serving the plat or reference to a separate recording instrument detailing the same.

Please discuss with the Stormwater Utility any other language requirements regarding surface water BMPs and other rights and responsibilities.

All vested owner(s) of the subject plat, at the time of recording, need to sign the final plat. For the street dedication process, include a current title report noting the vested property owner(s).

Technical Memorandum

10230 NE Points Drive
Suite 400
Kirkland, WA 98033
Phone (425) 822-4446
Fax (425) 827-9577

To:	Elizabeth Higgins, Senior Planner City of Renton
From:	Darcey Miller, Senior Wetland Scientist Kevin O'Brien, Senior Ecologist
Copies:	Greg Laird, PE
Date:	April 3, 2014
Subject:	Vuecrest Estates Wetland and Stream Review
Project No.:	32385.C

This review pertains to the Preliminary Plat application of Vuecrest Estates (City of Renton LUA13-000642) submitted by the applicant, Harbour Homes, to the City of Renton (City). The proposed Vuecrest Estates is located to the south of the intersection of South 47th Street and Smithers Avenue South, and east of Morris Avenue South. Otak has been asked by the City of Renton (the City) to review the submitted critical areas documents and to provide comments regarding their applicability to the Renton Municipal Code (RMC), specifically, Section 4-3-050, Critical Areas Regulations. A separate geotechnical peer review was also conducted by Hart Crowser and the results communicated to the City. This memo addresses critical areas associated with wetland, stream, and buffers.

The following documents were reviewed in terms of compliance with the critical areas sections of the City code:

- *Critical Area Study for Vuecrest*, prepared by Wetland Resources, Inc., dated April 8, 2013;
- *Supplemental Stream Study for Vuecrest Estates*, prepared by Wetland Resources, Inc., dated May 10, 2013;
- Environmental Committee Review Report for Vuecrest Estates, prepared by the City of Renton Department of Community and Economic Development, dated July 15, 2013;
- Vuecrest Estates plans (Sheets C1, C3-C7, and N1), prepared by D.R. Strong Consulting Engineers, and received by the City on May 21, 2013.

The Critical Area Study (CAS) and Supplemental Stream Study (SSS) identify an on-site Category 2 wetland per the RMC, and a Class 4 stream—also per the RMC—associated with the wetland. The

EXHIBIT 16

CAS indicates that wetland buffer averaging is proposed for the project site, and outlines the rationale for meeting the City's criteria for buffer averaging eligibility. The SSS assesses stream and stream buffer impacts, concluding that no loss of stream function or value will occur from the proposed project.

Comment 1
Otak biologists visited the site on February 28, 2014. We determined that the wetland delineation is accurate as flagged in the field, and agree that the wetland meets the criteria for a Category 2 wetland under RMC 4-3-050(M).

Recommendations: None

Comment 2
The CAS, SSS, and project plans show that the Class 4 intermittent stream begins in the southern, linear wetland and flows generally west within the wetland until it reaches the 40% slope area. During Otak's site visit, we determined that a stream does not appear to be present within this wetland; although it appears that water at times may flow through the wetland, no streambed, streambanks, or sorted gravels were observed. The stream begins at the 40% slope area, at wetland flag WRA-27, and continues generally west down the steep slope (as shown on Sheet C1)—showing defined channels, some incision, and generally indicative of a system with significantly more stream flow energy due to the much steeper gradients . We agree with the characterization of the stream as an intermittent, non-salmonid-bearing stream and the Class 4 rating.

Recommendations: We recommend that the applicant revise the CAS and SSS (combining the content is acceptable), and remove the stream from plans where it is shown within the wetland, revising the stream description and its linear dimensions accordingly. This revision means that overall, only a very small area of the 35-foot-wide stream buffer will be impacted, in the southwest corner of the proposed development area. This stream buffer impact area is included within the wetland buffer impact area, for which buffer averaging is already proposed.

Comment 3
According to the CAS Map (contained in the CAS), the proposal for wetland buffer averaging reduces the wetland buffers in four areas, totaling 10,468 square feet (sf). Buffer addition areas are proposed in four areas, three of which are labeled and total 12,195 sf. The applicant should revise the CAS Map to show the square footage of the triangular buffer averaging addition area immediately east of Lot 10. Although a minor discrepancy, page 3 of the CAS calls out 10,463 feet of buffer reduction and 12,198 square feet of buffer addition in contrast with the quantities on the CAS map.

Recommendations: Minor revision of the CAS to correct these discrepancies.

Comment 4
On page 3 of the CAS, the second sentence "Therefore buffer averaging is not proposed" should be amended to "...buffer enhancement..."

Recommendations: Minor revision of the CAS to correct this discrepancy.

Comment 5
The buffer averaging proposal in the CAS has demonstrated that it meets all of the requirements in RMC 4-3-050. Buffer averaging reduction areas on the project site are vegetated with native trees and contain an understory of native shrubs and some herbaceous groundcover. The buffer averaging addition areas contain similar vegetative communities as the reduction areas, and have approximately the same number of significant trees as the reduced areas (16-17 trees in each the addition and reduction areas). Non-native/invasive vegetation coverage is very low in the wetlands and buffers onsite. As such, the existing buffers and wetland areas are of moderate to high value. Adding plants could cause more disturbance to a natural and well-functioning system. For these reasons and the buffer averaging justification given in the CAS, it is our opinion that a wetland enhancement plan is not required to comply with Code, although the Environmental Committee Review Report (ECRR) (City of Renton; July 15, 2013) recommends one in the Water (Wetland and Stream) Mitigation Measure #1. However, recommended monitoring (see below) may result in wetland or buffer enhancement actions as an adaptive management response to vegetative loss or introduction of non-native invasive species.

Mitigation Measure #2 in the ECRR requests "a mitigation plan demonstrating enhancement of the areas where stream buffers are reduced." The review report says that a planting plan for reduced stream buffers is required, per RMC 4-3-050.L5.c.ii; however, this section of the code is for stream buffer *reduction*, not buffer averaging. As discussed in this comment above, it is our opinion that the buffer averaging proposal does not require a planting plan per the RMC. This is a moot point, as the stream is considered to be located only on the steep slope (not in the southern, linear wetland where buffer averaging is proposed).

The existing on-site habitat consists of contiguous, forested habitat with very little invasive plant species coverage. Much of the wetland system is contained within this interior forested habitat, although residential development encroaches on the wetland to the northeast. The proposed development adjacent to reduced buffer areas will result in overall reduction of this habitat, fragmentation of the remaining forested habitat, and a significant increase in edge habitat. These alterations are likely to result in non-native/invasive vegetation (e.g., Himalayan blackberry, English ivy, Scotch broom, etc.) invading the critical areas and their remaining buffers.

Recommendations: We recommend that all wetland and buffer areas onsite be monitored for 5 years, once per year in the summer, as a condition of project approval. If non-native/invasive vegetation is observed, it should be removed immediately (by hand). The monitoring should also determine whether additional plantings or other contingency actions are recommended as adaptive management approaches, in order to preserve the baseline conditions of the critical areas. We recommend that the applicant submit a monitoring plan (which may be included in the revised CAS) prior to issuance of utility and road construction permits. We recommend that the applicant post a bond (financial guarantee) for this monitoring period.

Comment 6

The plans show stormwater discharging from the detention/water quality vault into the wetland/stream buffer, approximately 40 feet to the northeast of the steep slope, at the beginning of the stream and the west end of the southern, linear wetland. According to the Geotechnical Engineering Study (Earth Solutions NW; February 25, 2013), " the sloped areas along the western margins of the site would be severely susceptible to erosion, in our opinion." In high-gradient stream systems with potentially erodible soils, any additional water could cause erosion on the slope. This erosion would likely eventually affect downstream habitat and water quality, and could destabilize the slope during rain events. Given the high risk of erosion, the position of the stormwater vault and the proposed discharge point, and the presence of protected slopes (40% or greater slopes), an alternative design and/or additional analysis are warranted.

Recommendations: We strongly reiterate and support the City's previous recommendation in the ECRR to tightline the discharge down the slope for the Vuecrest project, preferably discharging into a stormwater conveyance system that has capacity to accept these flows. Although the applicant conducted analysis of the stormwater vault using the King County Runoff Time Series Model per City of Renton Code, we recommend re-analysis of the proposed stormwater vault capacity and associated metrics (discharge duration and peak flow discharges) using a different model such as MGS Flood or WWHM if the proposed discharge to the wetland above the steep slope is retained as a design feature. In addition, should the proposed discharge point be retained as a design feature, greater detail concerning the outfall/discharge structure, proposed energy dissipation, and other relevant detail should be provided by the applicant.

Please feel free to call Darcey at (425)739-7977 or Kevin at (425) 739-7975 if we can answer any questions regarding our comments and recommendations.

Wetland Resources, Inc.
Delineation / Mitigation / Restoration / Habitat Creation / Permit Assistance

9505 19th Avenue S.E.
Suite 106
Everett, Washington 98208
(425) 337-3174
Fax (425) 337-3045

CRITICAL AREA STUDY

FOR

VUECREST

RENTON, WA

Wetland Resources, Inc. Project #12174

Prepared By:
Wetland Resources, Inc.
9505 19th Avenue SE, Suite 106
Everett, WA 98208
(425) 337-3174

Prepared For:
Harbour Homes by Geonerco
Attn: Jamie Waltier
1300 Dexter Ave Nm #500
Seattle, WA 98109

April 8, 2013

EXHIBIT 17

Table of Contents

SITE DESCRIPTION

Wetland Resources, Inc. (WRI) conducted a site investigation on September 6, 2012 on a 9.31-acre parcel located at the southern terminus of Smithers Avenue South in Renton, WA (portion of Section 31, Township 23N, Range 05E, W.M.). King County Tax Parcel #3123059048 is the subject property for this report. The purpose of this investigation was to identify any jurisdictional wetlands and streams on and in the vicinity of the subject parcel.

The investigation area is bordered by Morris Avenue South to the west, with residential development to the north, south and east. No structures are currently present within the boundary of the subject property. A temporary cul-de-sac associated with the terminus of Smithers Ave S is located in the north central portion of the site. The remaining portion of the site is forested and appears relatively undisturbed and is vegetated with a mixed canopy, non-mature forest. Topography of the site generally trends west with a slight depression near the eastern property boundary, a linear depression roughly paralleling the southern property line, and steep west aspect slope on the western half of the site.

As part of this investigation, one wetland and stream were identified on the subject property. The wetland is located within the depressional areas on the eastern and southern portions of the site. It is classified as a Category II wetland and is designated a 50-foot protective buffer from its flagged boundary. In addition to the wetland, an intermittent non-salmonid stream flows through the western portion of the wetland boundary and down the steep slope. This stream is classified as a Class 4 and is designated a 35-foot buffer from its flagged boundary. In situations where wetland and stream buffers overlap, the more restrictive shall apply.

PROJECT DESCRIPTION

The applicant is proposing to subdivide the eastern two-thirds of the property into twenty-one single-family residential lots. Access for these lots will be from the continuation of Smithers Avenue S. In order to accomplish this development activity, the applicant is proposing buffer averaging per the provisions established in RMC Chapter 4-3-050(M)(6)(f), which requires:

i. That the wetland contains variations in ecological sensitivity or there are existing physical improvements in or near the wetland and buffer; and

The on-site wetland varies from slightly disturbed in its northern portion with yard waste and detritus from kid-related activities to less disturbed in its southern portion. As such vegetation in the northern portion has a higher concentration of invasive species and the southern portion is more native in composition. In addition, existing single-family residential development is located immediately adjacent to the east of the wetland and buffer area.

ii. That width averaging will not adversely impact the wetland functions and values; and

Direct compensation of functions and values will be addressed by providing additional buffer of a similar composition to the reduction area at a 1:1 rating. No impacts to existing functions and values of the wetland area expected by the proposed buffer averaging activity.

iii. That the total area contained within the wetland buffer after averaging is not less than that contained within the required standard buffer prior to averaging; and

In order to meet the requirements established for buffer averaging a greater than 1:1 (reduction:addition) ratio is provided. The final buffer area will be slightly larger that prior to averaging.

iv. A site specific evaluation and documentation of buffer adequacy based upon *The Science of Wetland Buffers and Its Implications for the Management for Wetlands, McMillan 2000,* or similar approaches have been conducted. The proposed buffer standard is based on consideration of the best available science as described in WAS 365-195-905; or where the absence of valid scientific information, the steps in RMC 4-9-250F are followed..

The buffer evaluation method identified above provided provides detailed descriptions of buffer widths and overall effectiveness of protecting wetland and stream functions. Table 4 within the aforementioned document described the differences between 10-meter and a 20-meter buffer. As described in the table, both buffer widths provide an approximate 60 percent sediment and pollutant removal and provide limited habitat values. The averaging proposal combined with the tree retention tract will more usable wildlife habitat and an, on average, wider corridor that allows wildlife to move freely into the forested steep slope area to the west. It is the opinion of WRI that given the increase of 1,735 square feet in overall buffer area, the proposed buffer averaging provides for an adequate width to protect the wetland and stream.

v. In no instance shall the buffer width be reduced by more than fifty percent (50%) of the standard buffer or be less than twenty-five feet (25') wide. Greater buffer width reductions require review as a variance per subsection N3 of this Section and RMC 4-9-250B; and

The minimum proposed buffer width as part of this averaging activity is 25-feet, which is 50 percent of the standard 50-foot buffer.

vi. Buffer enhancement in areas where the buffer is reduced shall be required on a case-by-case basis where appropriate to site conditions, wetland sensitivity, and proposed land development characteristics.

The areas of reduction areas identified as part of this averaging proposal, are generally natively vegetated and would have a limited lift of function from enhancement. Therefore buffer averaging is not proposed.

The buffer averaging proposed is to average(reduce) 10,463 square feet of buffer adjacent to SE 186th Pl, the proposed stormwater tract, and Lots 9-11, 20, and 21. In order to meet the no net loss of buffer requirement, the applicant proposes 12,198 square feet of addition buffer adjacent to Lots 10, 12-17, 21 and along the south side of the Wetland and Stream corridor. The applicant will designate all the wetland, stream and associated buffers as a Native Growth Protection Area (NGPA) Tract.

WETLAND AND STREAM CLASSIFICATIONS – COWARDIN SYSTEM

According to the Cowardin System, as described in Classification of Wetlands and Deepwater Habitats of the United States, the classifications for the on-site wetland and streams are as follows:

Wetland: Palustrine, Forested, Broad-leaved Deciduous, Saturated.

Stream: Riverine, Intermittent, Streambed.

WETLAND AND STREAM CLASSIFICATIONS-CITY OF RENTON

Under the City of Renton's Critical Area Regulations in Renton's Municipal Code (RMC), Title 4 Chapter 3-050, the wetlands and streams within the vicinity of the subject site are classified as follows:

Wetland – Category II

The on-site wetland is a depressional wetland adjacent to the intermittent stream. This wetland is Classified as a Category II under the RMC 4-3-050(M), since it is located at the headwater of the on-site stream and, as such, receives a standard buffer of 50 feet.

Stream – Class 4

The intermittent stream originates within the on-site wetland near the southern property boundary and flows down the stream slope to the west. Stream B is a seasonal, non-fish bearing stream and, as such, classified under RMC 4-3-050(L) as a Class 4 stream and receives a standard buffer of 35 feet.

In the city of Renton, Class 2-4 streams, regulated wetlands and their buffers are designated collectively as Native Growth Protection Areas (NGPAs). As stated in RMC 3-50(E)4: *The common boundary between a native growth protection area and the abutting land must be permanently identified. This identification shall include permanent wood or metal signs on treated or metal posts. Sign locations and size specifications shall be approved by the City. Suggested wording is as follows: "Protection of this natural area is in your care. Alteration or disturbance is prohibited by law."*

Methodology

On site, routine methodology as described in the Washington State Wetlands Identification and Delineation Manual (Washington State Department of Ecology Publication #96-94, March 1997), was used for this determination, as required by the City of Renton. Under this method, the process for making a wetland determination is based on three sequential steps:

1.) Examination of the site for hydrophytic vegetation (species present and percentage cover).

2.) If hydrophytic vegetation is found, then the presence of hydric soils is determined.

3.) The final step is determining if wetland hydrology exists in the area examined under the first two steps.

The following criteria descriptions were used in the boundary determination:

Vegetation

The Washington State Wetlands Identification and Delineation Manual, 1997 edition, states that "more than 50 percent of the dominant species in each stratum present must be rated "Facultative" or wetter to meet hydrophytic vegetation criteria".

Soils

The Washington State Wetlands Identification and Delineation Manual, 1997, states that hydric soils are defined as soils that are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions in the upper part (within 18 inches of the surface). The criteria for a "wetland soil" is that a hydric soil must support hydrophytic vegetation and wetland hydrology indicators must be present. Field indicators are used for determining whether a given soil meets the definition and criteria for hydric soils.

The soils underlying this site are mapped in the *Soil Survey of King County Area Washington* as Alderwood gravelly sandy loam, 6 to 15 percent slopes.

The Alderwood soil unit is made up of moderately well drained soils that have a weakly consolidated substratum at a depth of 24 to 40 inches. In a representative profile, the surface layer and subsoil are very dark brown, dark brown, and grayish brown gravelly sandy loam about 27 inches thick. The substratum is grayish-brown, weakly consolidated to strongly consolidated glacial till that extends to a depth of 60 inches and more. Soils included with this soil mapping make up no more than 30 percent of the total acreage. Some areas are up to 25 percent Everett soils that have slopes of 15 to 30 percent, and some areas are up to 2 percent Bellingham, Norma, and Seattle soils, which are in depressions. Runoff is medium, and the erosion hazard is severe.

Hydrology Criteria

The Washington State Wetlands Identification and Delineation Manual, 1997 edition, states that criteria for designation as a wetland based on hydrology is met when "areas which are seasonally inundated and/or saturated to the surface for a consecutive number of days ≥12.5 percent of the growing season, provided that soil and vegetation parameters are met. Areas inundated or saturated between 5 and 12.5 percent of the growing season in most years may or may not be wetland. Areas saturated to the surface for less than 5 percent of the growing season are non-wetlands." Field indicators are employed in the determination that wetland hydrology parameters are met.

BOUNDARY DETERMINATION FINDINGS

Wetland

The on-site wetland is a linear depressional wetland located in the eastern and southern portions of the site. Vegetation within the wetland consists of a canopy of red alder (*Alnus rubra*, FAC) and western red cedar (*Thuja plicata*, Fac); with an understory of: salmonberry (*Rubus spectabilis*, FAC), spirea (*Spiraea douglasii*, FacW), lady fern (*Athyrium felix-femina*, Fac) edge (*Carex sp.*, OBL), and creeping buttercup (*Ranunculus repens*, FACW). Soils in this wetland are typically a black (2.5Y 2.5/1) silt loam from the surface to eight inches below. The sublayer is a dark grayish brown (2.5Y 4/2) silt loam with redoximorphic features present. Soils were dry to the surface during the September 2012 investigation.

The dominance of species rated "Facultative" or wetter satisfies the criteria for hydrophytic vegetation in the areas mapped as wetland. Based on field indicators of hydric soils, it appears that the areas mapped as wetland are saturated to the surface for more than 12.5 percent of the growing season, thereby fulfilling wetland hydrology criteria in the absence of observed primary indicators of hydrology. This wetland meets all criteria for designation as a wetland.

Non-Wetland

The areas mapped as non-wetland are generally forested with a mixed canopy non-mature forest. Vegetation species within the forest generally include Western red cedary (*Thuja plicata*, Fac), big-leaf maple (*Acer macrophyllum*, FacU), red alder (*Alnus rubra*, Fac), Oso-berry (*Oemleria cerasiformis*, FacU), red huckleberry (*Vaccinium parvifolium*, FacU), dewberry (*Rubus ursinus*, FacU), and swordfern (*Polystichum munitum*, FacU.

Non-wetland soils were typically a very dark grayish brown (10YR 3/2) silt loam with no redoximorphic features from the surface to 3 inches below. From 3 inches to greater than 18 inches the soils changes to a dark yellowish brown (10YR 3/4) silt loam with no redoximorphic features. These soils were dry during the September 2012 site visit.

Based on the lack of field indicators, it appears that areas of the site mapped as non-wetland are not saturated to the surface for more than 12.5 percent of the growing season, thereby not fulfilling wetland hydrology criteria.

WETLAND FUNCTIONS AND VALUES ASSESSMENT

Methodology

The methodology for this functions and values assessment is based on professional opinion developed through past field analyses and interpretation. This assessment pertains specifically to the wetlands and streams in the vicinity of the site, but is typical for assessments of similar systems common to Western Washington.

Functional Components

Wetlands in Western Washington perform a variety of ecosystem functions. Included among the most important functions provided by wetlands are: stormwater control, water quality improvement, fish and wildlife habitat, aesthetic value, recreational opportunities and education. The most commonly assessed functions and their descriptions are listed below. Assessments of these functions for the project site are provided in the "Analysis" section of this report.

Hydrologic Functions

Wetlands often function as natural water storage areas during periods of precipitation and flooding. By storing water that otherwise might be channeled into open flow systems, wetlands can attenuate or modify potentially damaging effects of storm events, reducing erosion and peak flows to downstream systems. Additionally, the soils underlying wetlands are often less permeable, providing long-term storage of stormwater or floodflow and controlling baseflows of downstream systems. Stormwater storage capacity and floodflow attenuation are generally a function of the size of the wetland and their topographic characteristics.

Water Quality

Surface water quality improvement is another evaluated function. Surface runoff during periods of precipitation increases the potential for sediments and pollutants to enter surface water. Wetlands improve water quality by acting as filters as water passes through them, trapping sediments and pollutants from surface water. Ponded areas within depressional wetlands also allow sediments to drop out of suspension, thereby increasing water quality. As development increases, the potential for polluted water to reach wetlands and streams also increases. Unnaturally high inputs of pollutants, which are often found in urbanized areas, along with the size of the wetlands and the vegetation structure within them are the main limiting factors of this function.

Wildlife Habitat

Wetlands have potential to provide diverse habitat for aquatic, terrestrial, and avian species for nesting, rearing, resting, cover, and foraging. Wildlife species are commonly dependent upon a variety of intermingled habitat types, including wetlands, adjacent uplands, large bodies of water, and movement corridors between them. Human intrusion, including development within and adjacent to wetlands, and impacts to movement corridors are the most limiting factors for wildlife habitat functions. Assessments of these functions for the project site are provided below.

Existing Conditions

Wetland

Hydrologic Function

The wetland is in a topographic depression adjacent to the intermittent stream. In general, depressional wetlands with direct connected to an intermittent stream have moderate potential to perform hydrologic functions. This wetland collects and temporarily stores precipitation as well as floodwater entering downstream sytems during storm events. This wetland provides a low to moderate value for this function.

Water Quality

The wetland is moderately densely vegetated and the residence time of water within this wetland is low to moderate, given its gradient and association with the stream. These characteristics allow for the wetland to serve somewhat as a filter and allow sediment in the water to settle. This wetland provides a low to moderate value for this function.

Wildlife Habitat

This wetland provides a low to moderate level of habitat interspersion given that it is primarily forested. This wetland provides secondary habitat to multiple species of birds. However, the size of this wetland and its proximity to residential development limits its ability to provide a high value for wildlife functions. This wetland provides a moderate value for this function.

WILDLIFE

During our September 2012 visit, few wildlife species were observed.

Avian species observed during the site visit include: American crow (*Corvus brachyrhynchos*), American robin (*Turdus migratorius*), house finch (*Carpodacus mexicanus*), black-capped chickadee (*Poecile atricapillus*), bushtit (*Psaltriparus minimus*), and red-breasted nuthatch (*Sitka canadensis*).

Mammals expected to use this site include: Virginia opossum (*Didelphis virginiana*), shrews (*Sorex spp.*), coyote (*Canis latrans*), gray squirrel (*Sciurus carolinensis*), and eastern cottontail rabbits (*Sylvilagus floridanus*).

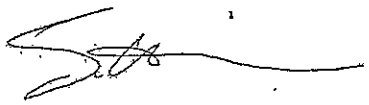
USE OF THIS REPORT

This Critical Area Study is supplied to Goldsmith Land Investments, LLC as a means of determining on-site environmentally sensitive area conditions, as required by the City of Renton. This report is based largely on readily observable conditions and, to a lesser extent, on readily ascertainable conditions. No attempt has been made to determine hidden or concealed conditions.

The laws applicable to critical areas are subject to varying interpretations and may be changed at any time by the courts or legislative bodies. This report is intended to provide information deemed relevant in the applicant's attempt to comply with the laws now in

effect. The work for this report has conformed to the standard of care employed by wetland ecologists. No other representation or warranty is made concerning the work or this report and any implied representation or warranty is disclaimed.

Wetland Resources, Inc.



Scott Brainard, PWS
Principal Ecologist

REFERENCES

City of Renton Municipal Code, Title 4 Chapter 3. Renton, WA. Ord. 5286, May 14, 2007.

Castelle, A.J., C. Conolly, M. Emers, E.D. Metz, S. Meyer, M. Witter, S. Mauermann, T. Erickson, and S.S. Cooke. 1992. Wetland Buffers: Use and Effectiveness. Washington. Department of Ecology, Publication No. 92-10. Olympia, WA.

Cooke, Sarah S. 2000. Wetland and Buffer Functions Semi-Quantitative Assessment Methodology (SAM). Cooke Scientific Services. February 2000.

Corps of Engineers Wetlands Delineation Manual, 1987. Technical Report Y-87-1. Environmental Laboratory. U.S. Army Engineer Waterway Experiment Station. Vicksburg, MS.

Cowardin, L. M., V. Carter, F. C. Golet, and E. T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. FWS/OBS-79/31. U.S. Fish and Wildlife Service, Washington DC. December 1979.

Hruby, T. 2004. Washington State Wetland Rating System for Western Washington-Revised. Washington State Department of Ecology Publication #04-06-025.

National List of Plant Species that Occur in Wetlands, Northwest Region. 1996. U.S. Department of the Interior, Fish and Wildlife Service. Washington, D.C.

Sheldon, D., T. Hruby, P. Johnson, K. Harper, A. McMillan, T. Granger, S. Stanley, and E. Stockdale. 2005. Wetlands in Washington State - Volume 1: A Synthesis of the Science. Washington State Department of Ecology. Publication #05-06-006. Olympia, WA. March 2005.

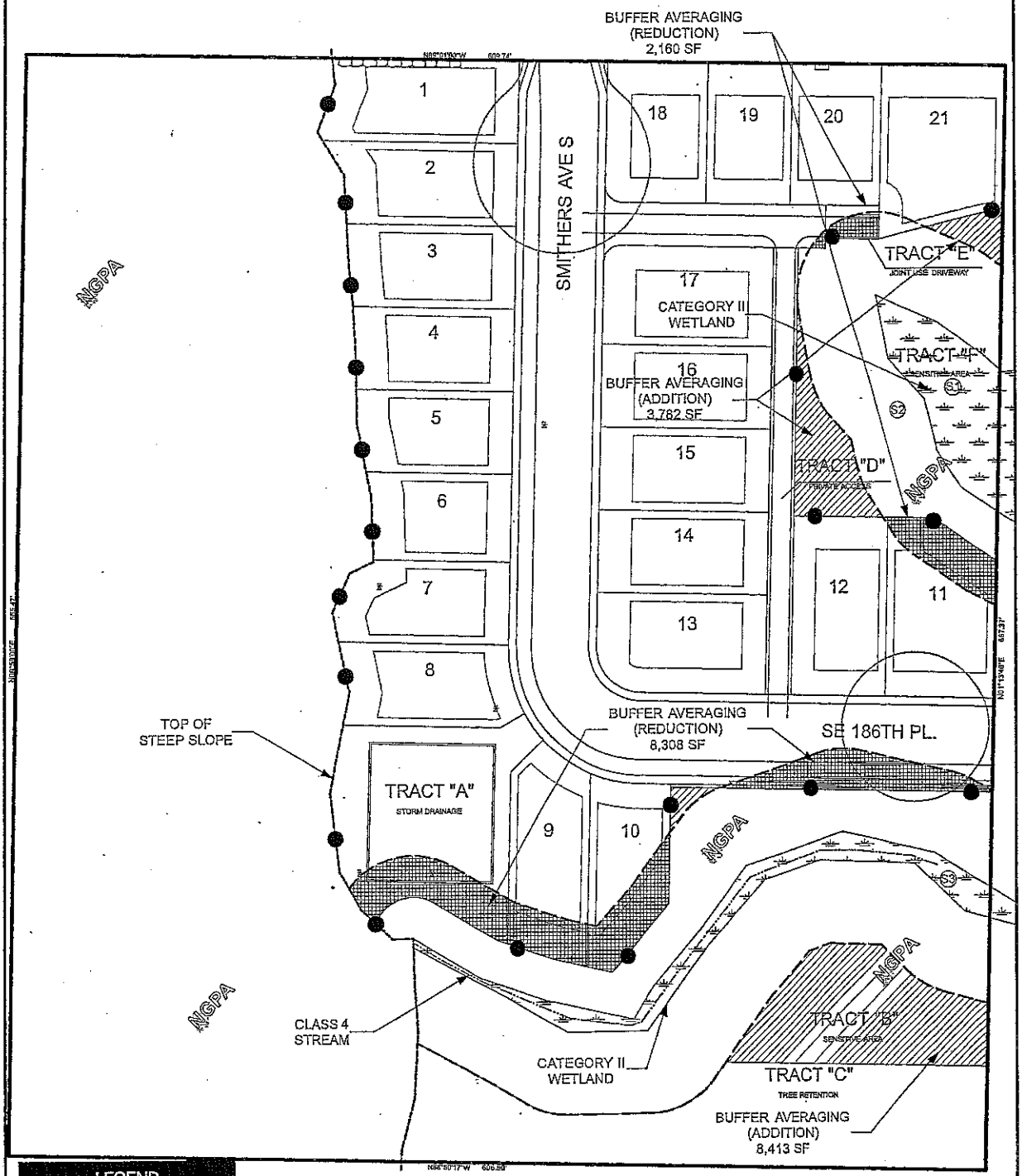
Soil Survey: King County Area, Washington. U.S.D.A. Soil Conservation Service. November 1973.

Washington State Wetlands Identification and Delineation Manual. Washington State Department of Ecology. Publication #96-94. March 1997.

CRITICAL AREA STUDY MAP

VUECREST

SECTION 31, TOWNSHIP 23N, RANGE 5E, WM



LEGEND

- WETLAND
- STREAM
- BUFFER
- BUFFER AVERAGING (REDUCTION)
- BUFFER AVERAGING (ADDITION)
- S1 S3 DATA SITES
- NGPA SIGNS

Scale 1" = 60'

0 30 60 90 120

Wetland Resources, Inc.

Phone: (425) 337-3174
Fax: (425) 337-3045

CRITICAL AREA STUDY MAP
VUECREST
RENTON, WA

Harbour Homes
Attn: Jamie Waltier
1300 Dexter Ave N, #300
Seattle, WA 98109

Sheet 1/1
WRI Job #12174
Drawn by: S. Brainard
Date: 4/8/13

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Vuemont City/County: Renton Sampling Date: 9/6/12

Applicant/Owner: Harbour Homes State: WA Sampling Point: S1

Investigator(s): SB Section, Township, Range: 31,23N, 5E

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): concave Slope (%): +/- 2%

Subregion (LRR): LRR-A Lat: 47.436295 Long: -122.208721 Datum:

Soil Map Unit Name: Alderwood 5 - 15% slopes NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No	**Is the Sampled Area within a Wetland?** Yes ✓ No
Hydric Soil Present?	Yes ✓ No	
Wetland Hydrology Present?	Yes No ✓	

Remarks:

Not present during site visit but secondary indicators were present

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1. Fraxinus latifolia	40	Y	FacW
2.			
3.			
4.			
	40	= Total Cover	
Sapling/Shrub Stratum (Plot size:)			
1. Spirea douglasii	60	Y	FacW
2. Rubus ursinus	20	Y	FacU
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	= Total Cover		
Woody Vine Stratum (Plot size:)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 66 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

Prevalence Index is ≤3.0[1]

Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Wetland Non-Vascular Plants[1]

Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes _____ No _____

Remarks:

SOIL

Sampling Point: _____

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-18+"	2.5Y 4/2	60	10YR 3/4	5	C	M	Sil	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ No _____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required: check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) **(LRR A)**
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ✓ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ✓ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ✓ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) **(LRR A)**
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): _____

Water Table Present? Yes ___ No ✓ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ___ No ✓ Depth (inches): _____

Wetland Hydrology Present? Yes ✓ No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Vuemont City/County: Renton Sampling Date: 9/6/12

Applicant/Owner: Harbour Homes State: WA Sampling Point: S2

Investigator(s): SB Section, Township, Range: 31,23N, 5E

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): concave Slope (%): +/- 5%

Subregion (LRR): LRR-A Lat: 47.436295 Long: -122.208721 Datum:

Soil Map Unit Name: Alderwood 5 - 15% slopes NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No ✓	Is the Sampled Area within a Wetland? Yes ____ No ✓
Hydric Soil Present?	Yes ____ No ✓	
Wetland Hydrology Present?	Yes ____ No ✓	

Remarks:

Not present during site visit but secondary indicators were present

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1. Thuja plicata	30	Y	Fac
2. Acer macrophyllum	30	Y	FacU
3.			
4.			
	60	= Total Cover	
Sapling/Shrub Stratum (Plot size: ____)			
1. Rubus ursinus	60	Y	FacU
2. Oemleria cerasiformis	20	Y	FacU
3. Vaccinium parviflorium	20	Y	FacU
4.			
5.			
	100	= Total Cover	
Herb Stratum (Plot size: ____)			
1. Polystichum munitum	10	Y	FacU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	10	= Total Cover	
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
		= Total Cover	

% Bare Ground in Herb Stratum ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

Prevalence Index is ≤3.0[1]

Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Wetland Non-Vascular Plants[1]

Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No ✓

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Vuemont City/County: Renton Sampling Date: 9/6/12

Applicant/Owner: Harbour Homes State: WA Sampling Point: S2

Investigator(s): SB Section, Township, Range: 31,23N, 5E

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): concave Slope (%): +/- 5%

Subregion (LRR): LRR-A Lat: 47.436295 Long: -122.208721 Datum:

Soil Map Unit Name: Alderwood 5 - 15% slopes NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No ✓	**Is the Sampled Area within a Wetland?** Yes ____ No ✓
Hydric Soil Present?	Yes ____ No ✓	
Wetland Hydrology Present?	Yes ____ No ✓	

Remarks:

Not present during site visit but secondary indicators were present

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer macrophyllum	70	Y	FacU
2. Thuja plicata	20	Y	Fac
3.			
4.			
	90	= Total Cover	
Sapling/Shrub Stratum (Plot size: ____)			
1. Rubus spectabilis	50	Y	Fac
2. Oemleria cerasiformis	20	Y	FacU
3. Sambucus racemosa	10	N	FacU
4.			
5.			
	80	= Total Cover	
Herb Stratum (Plot size: ____)			
1. Athyrium filix-femina	30	Y	Fac
2. Ranunculus repens	10	Y	FacW
3. Carex obnupta	10	Y	Obl
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	50	= Total Cover	
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____	= Total Cover	

% Bare Ground in Herb Stratum ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata: 8 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 62 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

Prevalence Index is ≤3.0[1]

Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Wetland Non-Vascular Plants[1]

Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks:

SOIL

Sampling Point: _____

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8"	2.5Y 2.5/1	80					Sil	
8-18+"	2.5Y 4/2	80	10YR 3/4	5	C	M	Sil	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ No _____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- Algal Mat or Crust (B4)
- Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- Aquatic Invertebrates (B13)
- Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- Presence of Reduced Iron (C4)
- Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) **(LRR A)**
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ✓ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ✓ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ✓ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- FAC-Neutral Test (D5)
- Raised Ant Mounds (D6) **(LRR A)**
- Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes _____ No ✓ Depth (inches): _____

Water Table Present? Yes _____ No ✓ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No ✓ Depth (inches): _____

Wetland Hydrology Present? Yes ✓ No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

SOIL

Sampling Point: _____

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3"	10YR 3/2	90					Sil	
3-18+"	10YR 3/4	90					Sil	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- Algal Mat or Crust (B4)
- Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- Aquatic Invertebrates (B13)
- Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- Presence of Reduced Iron (C4)
- Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) **(LRR A)**
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- FAC-Neutral Test (D5)
- Raised Ant Mounds (D6) **(LRR A)**
- Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes _____ No ✓ Depth (inches): _____

Water Table Present? Yes _____ No ✓ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No ✓ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Wetland Resources, Inc.
Delineation / Mitigation / Restoration / Habitat Creation / Permit Assistance

9505 19th Avenue S.E.
Suite 106
Everett, Washington 98208
(425) 337-3174
Fax (425) 337-3045

SUPPLEMENTAL STREAM STUDY

FOR

VUECREST ESTATES

RENTON, WA

Wetland Resources, Inc. Project #12174

Prepared By:
Wetland Resources, Inc.
9505 19th Avenue SE, Suite 106
Everett, WA 98208
(425) 337-3174

Prepared For:
Harbour Homes by Geonerco
Attn: Jamie Waltier
1300 Dexter Ave Nm #500
Seattle, WA 98109

May 10, 2013

EXHIBIT 18

Site Description

Wetland Resources, Inc. (WRI) conducted a site investigation on September 6, 2012 on a 9.31-acre parcel located at the southern terminus of Smithers Avenue S in Renton, WA (portion of Section 31, Township 23N, Range 05E, W.M.). King County Tax Parcel #3123059048 is the subject property for this report. The purpose of this investigation was to identify any jurisdictional wetlands and streams on and in the vicinity of the subject parcel. This report is intended to supplement the Critical Areas Study for Vuemont, dated April 8, 2013 (CAS), and meet the requirements established in RMC Section 4-8-120D.

The investigation area is bordered by Morris Avenue S to the west, with residential development to the north, south and east. No structures are currently present within the boundary of the subject property. A temporary cul-de-sac associated with the terminus of Smithers Ave S is located in the north central portion of the site. The remaining portion of the site is forested and appears relatively undisturbed and is vegetated with a mixed canopy, non-mature forest. Topography of the site generally trends west with a slight depression near the eastern property boundary, a linear depression roughly paralleling the southern property line, and steep west aspect slope on the western half of the site.

As part of this investigation, one wetland and stream were identified on the subject property. Details related to the wetland are identified in the CAS. An intermittent stream was identified exiting the southern portion of the property flowing west down the steep slopes identified as part of plat application. At the time of investigation the stream was entirely dry. Its channel becomes incised at the point it intersects the steep slope (greater than 40%) before exiting the site near its southwest corner.

The on-site stream is intermittent, non-salmonid, averaging approximately 2 feet wide has an average gradient of greater than 20 percent and is not mapped on King County iMap, Salmonscape or the Washington State Department of Natural Resources Maps. Per RMC 4-3-050L streams with these characteristics are classified as a Class 4 and is designated a 35-foot buffer from its flagged boundary. In situations where wetland and stream buffers overlap, the more restrictive shall apply.

Analysis of Alternatives

The applicant is proposing to subdivide the eastern two-thirds of the property into twenty-one single-family residential lots. Access for these lots will be from the continuation of Smithers Avenue S and extending east to a temporary turn around at SE 186th Pl. The applicant evaluated the potential for extending the road to the south, which would cross the wetland and stream system but opted to avoid the impact. No impacts are proposed to the Class 4 stream The only modification is buffer averaging which is primarily associated with the wetland buffer.

Avoidance – No impacts are proposed to the Class 4 stream. Multiple development alternatives were evaluated and it was determined that the goals of the development proposal could be accomplished by avoiding direct impacts to the stream. The buffer averaging would be necessary to accommodate the SE 186th Pl, the proposed stormwater detention tract, and Lots 9 and 10.

Minimization – Impacts to the stream have been minimized to the greatest extent possible. First by avoiding impacts as described above and second by limiting impacts to buffer averaging, primarily the wetland buffer, and only a very small portion of the stream buffer (the wetland buffer is the most restrictive).

Rectifying - No permanent or temporary impacts are proposed to the Class 4 stream, therefore no restoration is proposed.

Reducing – Tract B (Sensitive Area Tract) will be permanently protected and therefore the potential temporal impact associated with the buffer averaging will be reduced over time.

Compensating – The buffer averaging proposal meets the requirements established in RMC Chapter 4-3-050(L)(5)(d) and (M)(6)(f). In addition, high quality forested buffer will be provided on the southern side of the wetland and stream at the required 1:1 ratio.

IMPACT EVALUATION

(a) There is one Class 4 intermittent stream located within the boundary of the subject property. The stream averages approximately 2 feet wide and is approximately 650' long on site. It has a mud bottom with no cobble-gravel substrate. This stream primarily acts as a conveyance of hydrology from the upstream wetland. It does have a moderate water quality and stormwater storage function given the presence of instream woody and emergent vegetation and its association with the on-site wetland system. No fish habitat is present within the on-site portion of the stream or immediately downstream.

(b) The applicant is entirely avoiding impacts to the on-site stream. Buffer averaging is proposed along the stream/wetland system, but it mostly relates to the larger wetland buffer. It's unlikely any alternative site plans would have less impact to the stream system.

(c) The application meets the criteria established in RMC Chapter 4-3-050(L)(5)(d) and (M)(6)(f). and is entirely avoiding impacts to the on-site Class 4 stream therefore, no significant detrimental impacts are proposed or will occur as part of this project.

(d) Since no impacts are proposed to the Class 4 stream and the buffer averaging proposal averaging proposal has been designed to meet the criteria established in RMC Chapter 4-3-050(L)(5)(d) and (M)(6)(f), there are no expected cumulative detrimental environmental impacts associated with this application.

CONCLUSION

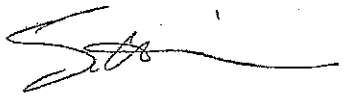
No reduction in the functions and values of the on-site Class 4 stream are expected from the implementation of this proposed development activity. The buffers adjacent to the stream, even in their averaged form, are generally larger than the standard buffers required for this type of stream in the City of Renton and therefore this stream is adequately protected.

USE OF THIS REPORT

This Critical Area Study is supplied to Harbour Homes by Geonerco as a means of determining on-site environmentally sensitive area conditions, as required by the City of Renton. This report is based largely on readily observable conditions and, to a lesser extent, on readily ascertainable conditions. No attempt has been made to determine hidden or concealed conditions.

The laws applicable to critical areas are subject to varying interpretations and may be changed at any time by the courts or legislative bodies. This report is intended to provide information deemed relevant in the applicant's attempt to comply with the laws now in effect. The work for this report has conformed to the standard of care employed by wetland ecologists. No other representation or warranty is made concerning the work or this report and any implied representation or warranty is disclaimed.

Wetland Resources, Inc.



Scott Brainard, PWS
Principal Ecologist

REFERENCES

City of Renton Municipal Code, Title 4 Chapter 3. Renton, WA. Ord. 5286, May 14, 2007.

Castelle, A.J., C. Conolly, M. Emers, E.D. Metz, S. Meyer, M. Witter, S. Mauermann, T. Erickson, and S.S. Cooke. 1992. Wetland Buffers: Use and Effectiveness. Washington. Department of Ecology, Publication No. 92-10. Olympia, WA.

Cooke, Sarah S. 2000. Wetland and Buffer Functions Semi-Quantitative Assessment Methodology (SAM). Cooke Scientific Services. February 2000.

Corps of Engineers Wetlands Delineation Manual, 1987. Technical Report Y-87-1. Environmental Laboratory. U.S. Army Engineer Waterway Experiment Station. Vicksburg, MS.

Cowardin, L. M., V. Carter, F. C. Golet, and E. T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. FWS/OBS-79/31. U.S. Fish and Wildlife Service, Washington DC. December 1979.

Hruby, T. 2004. Washington State Wetland Rating System for Western Washington-Revised. Washington State Department of Ecology Publication #04-06-025.

National List of Plant Species that Occur in Wetlands, Northwest Region. 1996. U.S. Department of the Interior, Fish and Wildlife Service. Washington, D.C.

Sheldon, D., T. Hruby, P. Johnson, K. Harper, A. McMillan, T. Granger, S. Stanley, and E. Stockdale. 2005. Wetlands in Washington State - Volume 1: A Synthesis of the Science.. Washington State Department of Ecology. Publication #05-06-006. Olympia, WA. March 2005.

Soil Survey: King County Area, Washington. U.S.D.A. Soil Conservation Service. November 1973.

Washington State Wetlands Identification and Delineation Manual. Washington State Department of Ecology. Publication #96-94. March 1997.

February 24, 2014

Mr. Greg Laird
Otak – Water and Natural Resources
10230 NE Points Drive, Suite 400
Kirkland, WA 98033

Re: Geotechnical Review of Permit Documents – Vuecrest Residential Development
4800 Block Smithers Avenue S
Renton, Washington
City of Renton Project No.: LUA13-000642
19017-00

Dear Greg:

This letter provides a summary of our geotechnical review of the geotechnical permit documents pertaining to the above-referenced development site. Our work was performed in accordance with the scope of work outlined in our Task Order dated January 30, 2014 as authorized by Otak on February 7, 2014.

PERMIT DOCUMENTS REVIEWED

We reviewed the following geotechnical permit documents:

- Geotechnical Engineering Study by Earth Solutions NW, LLC (ESNW), dated February 25, 2013;
- Slope Setback Letter by ESNW, dated April 10, 2013;
- Geotechnical Review Letter by Associated Earth Sciences, Inc (AESI), dated October 31, 2013;
- Slope Setback Letter by, dated April 10, 2013;
- Response to Geotechnical Review by ESNW, dated December 2, 2013;
- City of Renton email review comments by Elizabeth Higgins, dated December 9, 2013
- Geotechnical Addendum by ESNW, dated December 10, 2013; and
- Preliminary Plat Plan (C1) and Grading Plan (C4) by D.R.Strong Consulting Engineers, dated December, 2013;

1700 Westlake Avenue North, Suite 200
Seattle, Washington 98109-6212
Fax 206.328.5581
Tel 206.324.9530

EXHIBIT 19

REVIEW COMMENTS

Based on our review of the above-referenced documents, it is our opinion that the applicant's geotechnical engineer (ESNW) has addressed the review comments provided by the City of Renton peer review geotechnical engineer (AESI; letter dated October 31, 2013) in a manner that is generally consistent with current geotechnical practice in our local area. We understand that no additional follow-up review by AESI has occurred after the ESNW response. However, in their December 2, 2014 response to the AESI review comments, ESNW submitted additional slope stability analyses and addressed AESI's questions regarding geologic cross section and deeper soil conditions. Additionally, in their December 10, 2013 letter, ESNW also provided the minimum risk statement (three conditions of no adverse development impact), as required by Renton Municipal Code (RMC 4-3-050-J2.b) and requested by the City of Renton in their email correspondence dated December 9, 2013.

A brief summary of the main geotechnical review comments by AESI and final responses by ESNW, along with our comments, is provided below for your information:

1. AESI commented that additional geologic cross sections and more detailed and deeper subsurface information was required for the slope stability analysis. ESNW generally responded in their December 2 letter that additional explorations should not be necessary since the test pit explorations confirmed dense, glacially-derived soil and perched groundwater conditions across the site, and that the risk of deeper subsurface uncertainty (such as risk of a potential weaker soil slippage plane) is very low. Given the geologic mapping of glacial soils at the site and the relatively low inclination of the steep slopes (about 50 percent, or 2Horizontal:1Vertical [1H:1V]), we concur this assessment is consistent with common geotechnical engineering practice.

2. The current proposal is to construct house footings on the planned fill slope, with a setback of 20 feet from the existing top of the steep slope area. AESI commented that the proposed 2H:1V fill slope at the top of the existing steep slopes (sensitive area) should also be considered a regulated sensitive/protected slope (if greater than 15-foot high), with the additional development setback requirement behind the top of the planned fill slopes. ESNW responded in their December 2 letter by reducing the fill slope height to 15 feet and providing a 10-foot setback from the existing top of steep slope area to the toe of the planned fill slope, while maintaining the 20-foot setback from the existing (native) top of slope. Given the provided slope stability analysis showing a static and seismic safety factor against slope failure of 1.78 and 1.22, respectively, for this condition, we would consider this a reasonable design based on common geotechnical engineering practice. For

reference, slope stability safety factors of 1.5 in the static case and 1.1 in the seismic case are generally considered adequate in local geotechnical engineering practice.

3. AESI commented that there were several issues with the initial slope stability analyses provided. In our opinion, these were adequately addressed by ESNW with their supplemental slope stability runs submitted on December 2, 2013, based on common geotechnical engineering practice.

4. The original design proposal included a 4-foot high rockery at the base of the planned 2H:1V fill slope. AESI commented that an unreinforced rockery should not be used as a retaining wall structure. ESNW responded by removing this rockery from the design. In addition, the toe of the fill slope was also moved 10 feet back from the existing top of steep slope area, as discussed in item 2 above.

5. A stormwater detention vault is proposed near an existing drainage ravine at the south end of the site, with a planned release of stormwater into the existing ravine. Given the classification of the site soils as "high erosion hazard," AESI commented that the applicant should demonstrate that such stormwater discharge will not cause erosive flows within the existing ravine, or provide alternate discharge design to prevent stormwater directed over the site slopes. ESNW responded in their December 10 letter that storm drainage facilities have been designed to discharge stormwater at a pre-developed flow rate into the existing ravine, which will reduce the potential for instability. While this sounds like a reasonable approach, we recommend that the applicant be required to provide a stormwater collection and discharge design stamped by a licensed civil engineer with expertise in stormwater design. This design should specifically address the potential for increased surface erosion and potential for slope instability with associated with the proposed design.

SUMMARY

ESNW provided the following code-required minimum risk statement in their December 10 letter:

- The proposal will not increase the threat of the geological hazard to adjacent or abutting properties beyond pre-development conditions;
- The proposal will not adversely impact other critical areas; and
- The proposal can be safely accommodated on the site.

Given the presence of competent glacial soils at the site, the relatively low inclination of the existing steep slopes (2H:1V), and the slope stability analyses demonstrating static and seismic safety factors

against slope failure exceeding the generally accepted values of 1.5 in the static case and 1.1 in the seismic case, we consider this a reasonable statement based on common geotechnical engineering practice in this area.

USE OF THIS LETTER

Work for this project was performed, and this letter was prepared, in accordance with generally accepted professional practices for the nature and conditions of the work completed in the same or similar localities, at the time the work was performed. It is intended for the exclusive use of Otak and the City of Renton, or their consultants, for specific application to the referenced site. This report is not meant to represent a legal opinion. No other warranty, express or implied, is made.

We based our review on subsurface conditions interpreted from subsurface soil and groundwater conditions reported by others. The nature and extent of conditions between the explorations may differ from those presented. If significant subsurface variations become evident during construction, we recommend that the geotechnical engineer of record be consulted to provide revised design recommendations, as needed.

CLOSING

We thank you for this opportunity to provide geotechnical consulting services. If you have any questions, please contact Rolf Hyllseth at (206) 826-4586.

Sincerely,

HART CROWSER, INC.

Rolf Hyllseth

MICHAEL J. BAILEY
STATE OF WASHINGTON
22484
REGISTERED
PROFESSIONAL ENGINEER

2.24.14

ROLF B. HYLLSETH, PE
Associate Geotechnical Engineer
rolf.hyllseth@hartcrowser.com

MICHAEL BAILEY, PE
CEO
mike.bailey@hartcrowser.com

December 10, 2013
ES-2660.01

Earth Solutions NW LLC

- Geotechnical Engineering
- Construction Monitoring
- Environmental Sciences

Geonerco Properties, LLC
1441 North 34th Street, #200
Seattle, Washington 98103

Attention: Mr. Jamie Waltier

Subject: Geotechnical Addendum
Proposed Vuecrest Residential Plat
Smithers Avenue Residential Plat
Renton, Washington

Reference: Earth Solutions NW, LLC
Response to Review Comments
ES-2660.01, dated December 2, 2013

Earth Solutions NW, LLC
Geotechnical Engineering Study
ES-2660, dated February 2013

Earth Solutions NW, LLC
Slope Setback Letter
ES-2660.01, dated July 15, 2013

D.R. Strong Consulting Engineers
Revised Site Plan

Associated Earth Sciences, Inc. (AESI)
Geotechnical Review Letter
Project TE130415A, dated October 31, 2013

Dear Mr. Waltier:

As requested, Earth Solutions NW, LLC (ESNW) has prepared this letter to address comments provided in the referenced geotechnical review letter for the subject project. This letter specifically addresses concerns regarding stability of the project and potential impacts to the site and surrounding properties as outlined in City of Renton Municipal Code Section 4-3-050J.2.b, as noted in a December 9, 2013 email from City of Renton staff.

EXHIBIT 20

Comment – Subsurface Conditions

Regarding the ESNW response letter, at least one issue seems to remain outstanding. This is the requirement that the following three conditions (RMC 4-3-050J.2.b) be met by the proposal:

- *The proposal will not increase the threat of the geological hazard to adjacent or abutting properties beyond pre-development conditions; and*
- *The proposal will not adversely impact other critical areas; and*
- *The development can be safely accommodated on the site.*

Response

Based on the conditions encountered at the test pit locations, review and collaboration with the project design team and our understanding of the project, the following details address the three conditions provided in the comment:

- There have been no recorded landslide events on the site based on review of readily available information, nor were there signs of excessive or chronic erosion or landslide activity observed during site visits conducted by ESNW representatives. Review of King County iMAP aerial photos dating as far back as 1936 show complete forested conditions and no signs of landslide activity (we acknowledge the gap of aerial coverage between 1936 and 1989).
- Subsurface conditions encountered at the test pit locations indicate, from a geotechnical standpoint, relatively consistent engineering properties exist within the soil strata across the site and have been considered in developing recommendations for the current proposal.
- Site designs have been modified to reduce the impacts to steeply sloped areas of the property. This approach will mitigate the potential for instability compared to the pre-development condition.
- Storm drainage facilities and elements have been designed to a) collect and convey runoff to a detention vault, and b) discharge at a pre-developed rate within an existing drainage pathway. This condition will decrease the potential for instability compared to the pre-development condition.
- Grading activities will be designed, i.e. structural fill, placement methods, drainage, foundation setbacks, etc. which will ensure the final configuration is as stable and resistant to landslide activity as the pre-development condition.
- The proposal is consistent with surrounding developments which, to our knowledge, have not been adversely impacted by landslide activity.
- Finally, the SlopeW analysis included in the referenced letter indicates a) no decrease in critical factor-of-safety values from a post-construction condition, and b) acceptable critical factor-of-safety* values from a global standpoint. This analysis agrees with the conditions encountered at the test pit locations.

* Critical factor-of-safety is defined herein as the lowest factor-of-safety calculated in the SlopeW analysis.

Closure

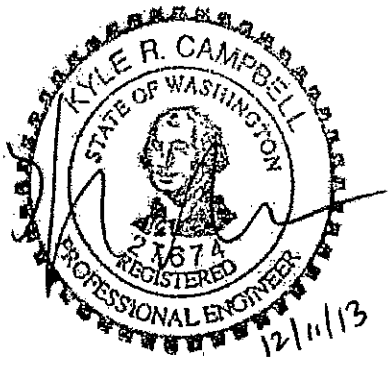
In our opinion, based on the above criteria and our understanding of the proposal, the project:

- will not increase the threat of the geological hazard to adjacent or abutting properties beyond pre-development conditions; and
- The proposal will not adversely impact other critical areas; and
- The development can be safely accommodated on the site.

If you have any questions, or if additional information is required, please call.

Sincerely,

EARTH SOLUTIONS NW, LLC



Scott S. Riegel, L.G.
Project Manager

Kyle R. Campbell, P.E.
Principal

cc: DR Strong Consulting Engineers, Inc.
Attention: Mr. Maher Joudi (Email only)

December 2, 2013
ES-2660.01

Earth Solutions NW LLC

- Geotechnical Engineering
- Construction Monitoring
- Environmental Sciences

Geonerco Properties, LLC
1441 North 34th Street, #200
Seattle, Washington 98103

Attention: Mr. Jamie Waltier

Subject: Response to Geotechnical Review
Proposed Vuecrest Residential Plat
Smithers Avenue Residential Plat
Renton, Washington

Reference: Earth Solutions NW, LLC
Geotechnical Engineering Study
ES-2660, dated February 2013

Earth Solutions NW, LLC
Slope Setback Letter
ES-2660.01, dated July 15, 2013

D.R. Strong Consulting Engineers
Revised Site Plan

Associated Earth Sciences, Inc. (AESI)
Geotechnical Review Letter
Project TE130415A, dated October 31, 2013

Dear Mr. Waltier:

As requested, Earth Solutions NW, LLC (ESNW) has prepared this letter to address comments provided in the referenced geotechnical review letter for the subject project. ESNW previously prepared the referenced geotechnical engineering study and subsequent letters for the site and has been providing ongoing geotechnical consulting services during the design phase of the project.

EXHIBIT 21

AESI Comment 1 – Subsurface Conditions

Review comment 1 discusses the geologic conditions which were described in published geologic map resources and compares those to the subsurface conditions described in the referenced report prepared by ESNW. The review comment suggests that the conditions described in the referenced report do not adequately describe the stratigraphy of the subject site.

Response

ESNW conducted subsurface explorations across accessible areas of the subject site during preparation of the referenced report. We also reviewed readily available geologic map resources to supplement the directly observed site conditions. While a full stratigraphic exploration program was not completed for this site and the descending slope to the west, in our opinion, the exploration program provides adequate information regarding the soil and groundwater conditions which would most likely impact the proposed project. The soils observed along the western portion of the site consisted of silt in a stiff to hard condition at depth, while the soils across the remaining area of the site generally consisted of isolated areas of outwash transitioning quickly to dense silty sand deposits. No groundwater was observed. In this respect, while soil from differing depositional environments may be present, the relative density and lack of groundwater supports a general description in terms of engineering properties. Furthermore, while there is the presence of silt deposits near the western side of the site, it is overlain by soils which have very low permeability characteristics to the east; therefore, the risk of a slippage plane being present or developing is very low. The site conditions which pose the greatest risk are related to controlling surface water flow and the effects of erosion, which are addressed in the referenced report and reflected in the current design, largely in the form of controlled stormwater management and engineered fill.

The proposed project includes construction of single-family residences, access roadways and infrastructure improvements including a stormwater detention vault. It is acknowledged in the referenced report that landslide and erosion hazards are on or adjacent to the subject site and those conditions were discussed in the referenced report. A cross-section was developed through the site based on the conditions encountered and the proposed grading plans to evaluate overall stability. The cross-section is attached.

AESI Comment 2 and 3 – Landslide Hazard Analysis

Comments 2 and 3 relate to the descending steep slope, characterizing the potential landslide hazard and providing setbacks from the proposed fill slopes.

Response

The grading plans have been modified to omit the rockery at the base of the fill slope and the new slope height is lowered to about 15 feet. The current proposal addresses the comments provided in items 2 and 3. With respect to the adequacy of the potential landslide analysis, a slope stability analysis for existing and currently proposed finish grades is attached. The results of the stability analysis suggests that the proposed grading plan will not increase the potential for landslide activity on the site or adjacent steep slope areas.

AESI Comment 4 – Foundation Setbacks

Review Comment 4 suggests the minimum foundation setback reference be the outside face of the lowermost foundation element measured to the face of the finish grade at the permanent slope.

Response

We agree with this reference and it should be included in the final approved plans.

AESI Comment 5 – Fill Slope Height

The review comment indicates that creating a 2H:1V slope over 15 feet in height 'creates' a landslide hazard. The current plan proposal maintains permanent fill slope heights to less than 15 feet, therefore, this comment is adequately addressed.

AESI Comment 6 – SlopeW Analysis

The review comment suggests that inadequate input parameters were used or that the factors-of-safety reported did not agree with the calculations for the slope stability modeling analysis.

Response

The attached slope stability analysis used strength parameters which reflect the soil conditions present on the site, and are valid for this project. It is important to note that computer models are a tool and part of the overall evaluation of a site and proposed project. When employing such a tool to assess a project, we use professional judgment to evaluate the results. In this respect, we filter factors-of-safety output to identify what we expect is most likely for a given site and conditions. It is often the case that a critical failure surface which is generated from a computer program may not agree with what we expect to see on a particular site. Therefore, we choose a slip surface which most agrees with what we would expect to occur and present the corresponding factor-of-safety in our report.

AESI Comment 7

This comment is addressed in the current proposal.

AESI Comment 8

This comment is addressed in the current proposal.

AESI Comment 9

Comment 9 relates to the IBC code year recognized for this project, which is the 2012 version.

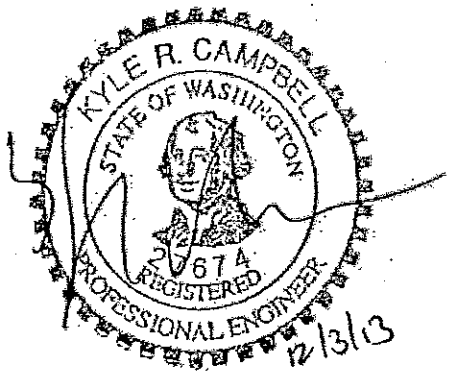
Response

The 2012 IBC recognizes ASCE for seismic site class definitions. If the project will be permitted under the 2012 IBC, in accordance with Table 20.3-1 of ASCE, Minimum Design Loads for Buildings and Other Structures, Site Class C, should be used for design.

If you have any questions, or if additional information is required, please call.

Sincerely,

EARTH SOLUTIONS NW, LLC

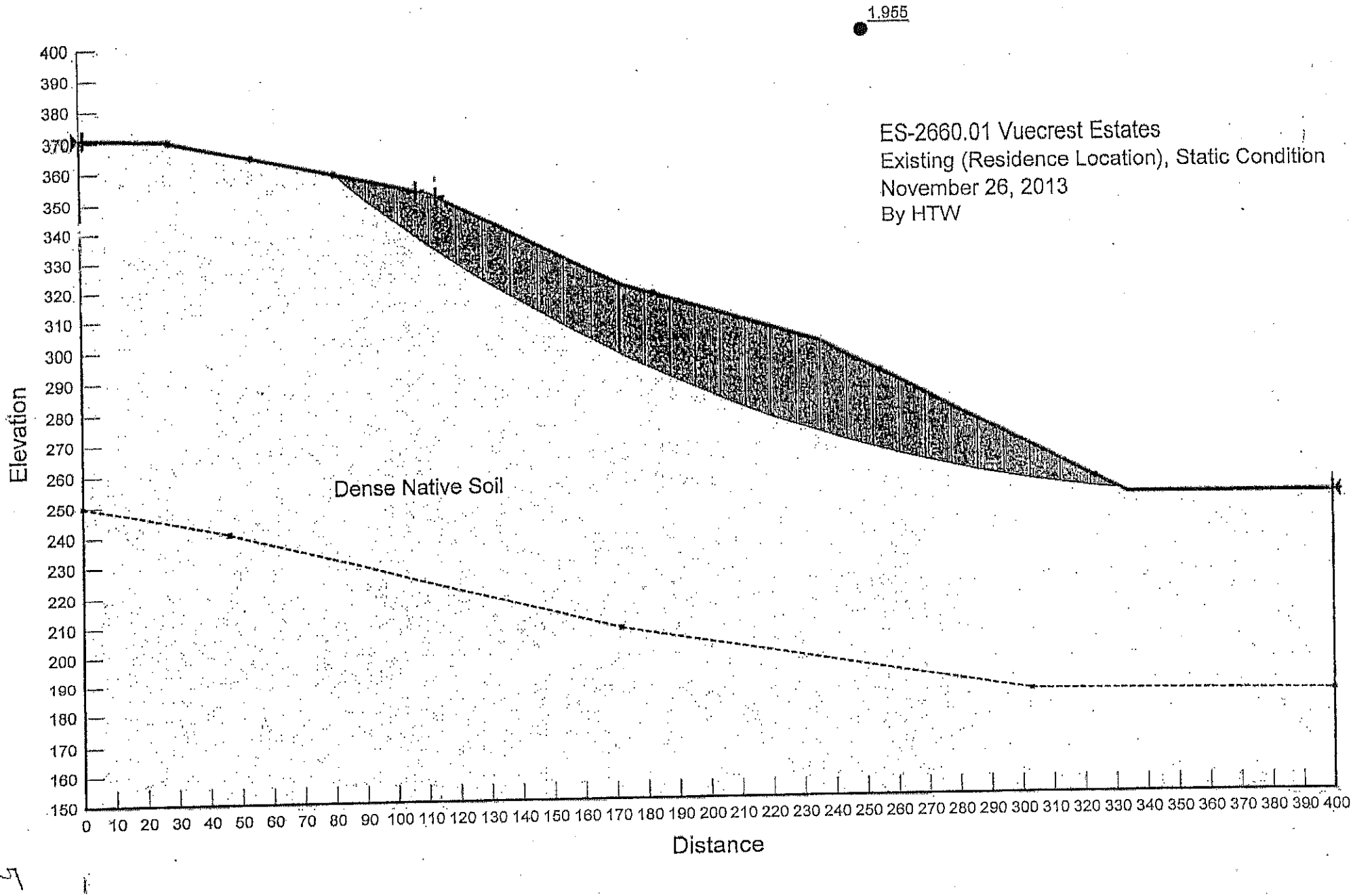


Scott S. Riegel, L.G.
Project Manager

Kyle R. Campbell, P.E.
Principal

Attachment: Slope W Computer Output

cc: DR Strong Consulting Engineers, Inc.
Attention: Mr. Maher Joudi (Email only)


1.955
ES-2660.01 Vuecrest Estates
Existing (Residence Location), Static Condition
November 26, 2013
By HTW
Dense Native Soil
Elevation
400
390
380
370
360
350
340
330
320
310
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390 400
Distance

Slope Stability

File Information

Title: Vuecrest
Created By: Henry Wright
Revision Number: 17
Last Edited By: Henry Wright
Date: 11/26/2013
Time: 1:34:37 PM
File Name: Vuecrest Existing (Residence), Static Condition.gsz
Directory: C:\Users\henry.wright\Documents\SlopeW\Vuecrest Estates\
Last Solved Date: 11/26/2013
Last Solved Time: 1:34:38 PM

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

Slope Stability

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Apply Phreatic Correction: No
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: Piezometric Line
Use Staged Rapid Drawdown: No
Slip Surface
Direction of movement: Left to Right
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: No
Tension Crack
Tension Crack Option: (none)
FOS Distribution

FOS Calculation Option: Constant
Advanced
Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Dense Native Soil

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 200 psf
Phi: 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (1.24812, 370.9532) ft
Left-Zone Right Coordinate: (107.02561, 352.95612) ft
Left-Zone Increment: 4
Right Projection: Range
Right-Zone Left Coordinate: (113.3958, 350.93716) ft
Right-Zone Right Coordinate: (400, 250) ft
Right-Zone Increment: 4
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (0, 371) ft
Right Coordinate: (400, 250) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
	0	249.88736
	46.27953	240.31824
	171.63495	207.50984
	302.86855	184.40726
	400	183.45035

Seismic Loads

Horz Seismic Load: 0

Regions

	Material	Points	Area (ft^2)
Region 1	Dense Native Soil	10,9,8,3,4,5,6,7,1,2	64129.713

Points

	X (ft)	Y (ft)
Point 1	400	150
Point 2	0	150
Point 3	111.10083	352.14108
Point 4	172.10083	320.14108
Point 5	236	300
Point 6	334	250
Point 7	400	250
Point 8	101.10083	354.14108
Point 9	26.67	370
Point 10	0	371

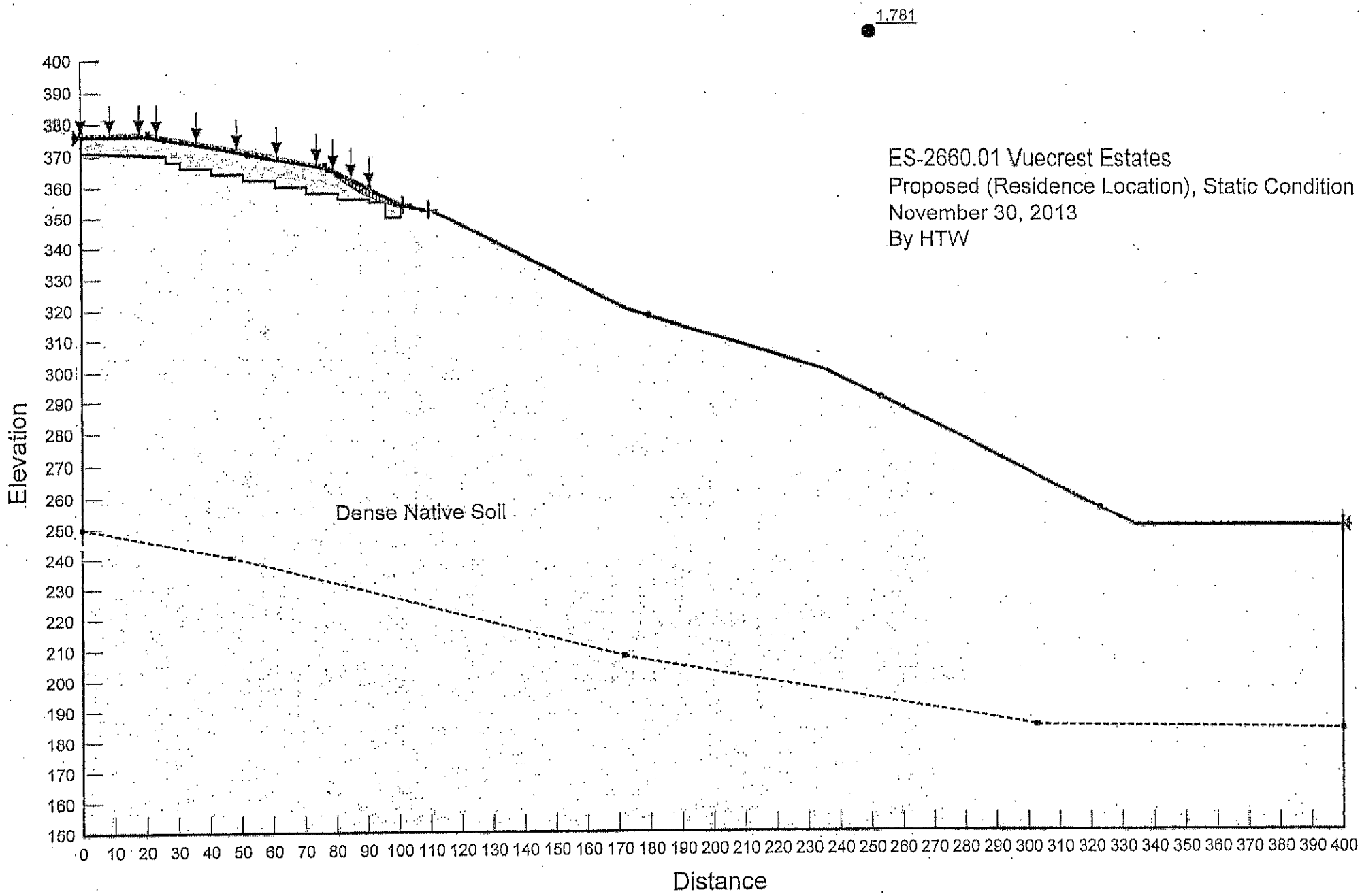
Critical Slip Surfaces

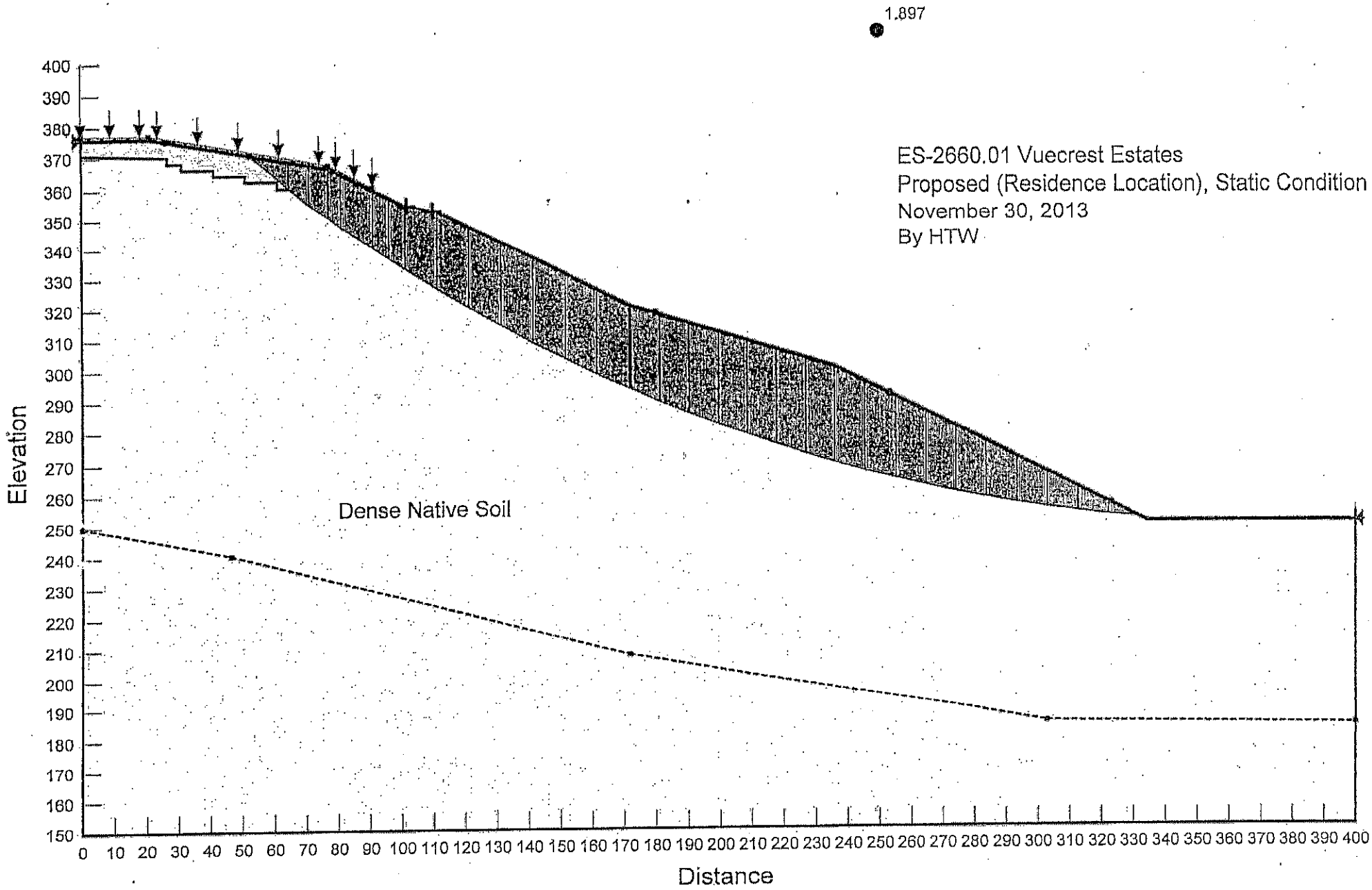
	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	97	1.955	(372.681, 693.708)	444.548	(80.7049, 358.487)	(331.989, 251.026)

Slices of Slip Surface: 97

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	97	85.80389	354.17855	-7750.1264	242.09876	169.51938	200
2	97	96.001835	345.8151	-7395.0085	826.71585	578.87267	200
3	97	106.1008	338.0126	-7073.1077	1356.1104	949.55874	200
4	97	115.4247	331.19685	-6800.0883	1682.2929	1177.9542	200
5	97	124.07245	325.2113	-6567.8275	1817.6223	1272.7129	200
6	97	132.72015	319.52135	-6353.9421	1933.3895	1353.7739	200
7	97	141.3679	314.11365	-6157.8067	2031.7336	1422.6352	200

8	97	150.01565	308.97635	-5978.4111	2113.6717	1480.0088	200
9	97	158.66335	304.09875	-5815.3076	2179.7902	1526.3055	200
10	97	167.3111	299.47115	-5667.7721	2229.9835	1561.4512	200
11	97	171.8679	297.1008	-5593.1267	2252.4174	1577.1597	200
12	97	176.0945	295.0137	-5509.2413	2348.527	1644.4563	200
13	97	184.0819	291.17335	-5357.3289	2535.534	1775.4	200
14	97	192.0693	287.52635	-5217.4488	2711.3391	1898.5001	200
15	97	200.0567	284.06755	-5089.3923	2874.8323	2012.9793	200
16	97	208.0441	280.79225	-4972.7354	3024.5768	2117.8315	200
17	97	216.0315	277.69605	-4867.3107	3158.5615	2211.6486	200
18	97	224.0189	274.775	-4772.758	3274.3024	2292.6913	200
19	97	232.0063	272.0255	-4688.9979	3369.5418	2359.3786	200
20	97	240.1793	269.38815	-4614.1102	3349.1241	2345.0819	200
21	97	248.53785	266.8676	-4548.6951	3205.2011	2244.306	200
22	97	256.8964	264.5246	-4494.3075	3025.7366	2118.6436	200
23	97	265.255	262.3563	-4450.8388	2809.7668	1967.4199	200
24	97	273.61355	260.36005	-4418.1356	2557.3216	1790.6559	200
25	97	281.9721	258.53345	-4395.8811	2269.6768	1589.2448	200
26	97	290.3307	256.87445	-4384.187	1948.7888	1364.5566	200
27	97	298.6893	255.38115	-4382.8931	1598.1227	1119.0176	200
28	97	307.722	253.95875	-4342.9891	1189.3435	832.78727	200
29	97	317.4288	252.6338	-4266.3217	723.85176	506.84646	200
30	97	327.1356	251.5259	-4203.1494	237.43208	166.25173	200


1.781
ES-2660.01 Vuecrest Estates
Proposed (Residence Location), Static Condition
November 30, 2013
By HTW
Dense Native Soil
Elevation
Distance
400
390
380
370
360
350
340
330
320
310
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390 400


1.897
ES-2660.01 Vuecrest Estates
Proposed (Residence Location), Static Condition
November 30, 2013
By HTW
Dense Native Soil
Elevation
Distance
400
390
380
370
360
350
340
330
320
310
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390 400

Slope Stability

File Information

Title: Vuecrest
Created By: Henry Wright
Revision Number: 20
Last Edited By: Henry Wright
Date: 11/30/2013
Time: 1:17:20 PM
File Name: Vuecrest Proposed(Residence), Static Condition.gsz
Directory: C:\Users\henry.wright\Documents\SlopeW\Vuecrest Estates\
Last Solved Date: 11/30/2013
Last Solved Time: 1:17:22 PM

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

Slope Stability

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Apply Phreatic Correction: No
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: Piezometric Line
Use Staged Rapid Drawdown: No
Slip Surface
Direction of movement: Left to Right
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: No
Tension Crack
Tension Crack Option: (none)
FOS Distribution
FOS Calculation Option: Constant

Advanced
- Number of Slices: 30
- Optimization Tolerance: 0.01
- Minimum Slip Surface Depth: 0.1 ft
- Optimization Maximum Iterations: 2000
- Optimization Convergence Tolerance: 1e-007
- Starting Optimization Points: 8
- Ending Optimization Points: 16
- Complete Passes per Insertion: 1
- Driving Side Maximum Convex Angle: 5 °
- Resisting Side Maximum Convex Angle: 1 °

Materials

Dense Native Soil
- Model: Mohr-Coulomb
- Unit Weight: 125 pcf
- Cohesion: 200 psf
- Phi: 35 °
- Phi-B: 0 °
- Pore Water Pressure
  - Piezometric Line: 1

Select Fill Soil
- Model: Mohr-Coulomb
- Unit Weight: 130 pcf
- Cohesion: 0 psf
- Phi: 32 °
- Phi-B: 0 °
- Pore Water Pressure
  - Piezometric Line: 1

Slip Surface Entry and Exit
- Left Projection: Range
- Left-Zone Left Coordinate: (0.18509, 376) ft
- Left-Zone Right Coordinate: (101.63203, 354.03484) ft
- Left-Zone Increment: 4
- Right Projection: Range
- Right-Zone Left Coordinate: (109.77425, 352.4064) ft
- Right-Zone Right Coordinate: (400, 250) ft
- Right-Zone Increment: 4
- Radius Increments: 4

Slip Surface Limits
- Left Coordinate: (0, 376) ft
- Right Coordinate: (400, 250) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
	0	249.88736
	46.27953	240.31824
	171.63495	207.50984
	302.86855	184.40726
	400	183.45035

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 250 pcf
Direction: Vertical

Coordinates

	X (ft)	Y (ft)
	0	377
	21	377
	77	367
	91	360

Seismic Loads

Horz Seismic Load: 0

Regions

	Material	Points	Area (ft^2)
Region 1	Dense Native Soil	10,9,28,27,26,25,24,23,22,20,21,19,18,17,16,15,14,31,30,29,8,3,4,5,6,7,1,2	63994.441
Region 2	Select Fill Soil	13,10,9,28,27,26,25,24,23,22,20,21,19,18,17,16,15,14,31,30,29,8,11,12	654.8246

Points

	X (ft)	Y (ft)
Point 1	400	150
Point 2	0	150
Point 3	111.10083	352.14108
Point 4	172.10083	320.14108

Point 5	236	300
Point 6	334	250
Point 7	400	250
Point 8	101.10083	354.14108
Point 9	26.67	370
Point 10	0	371
Point 11	77	366
Point 12	21	376
Point 13	0	376
Point 14	91	355
Point 15	91	356
Point 16	81	356
Point 17	81	358
Point 18	71	358
Point 19	71	360
Point 20	61	362
Point 21	61	360
Point 22	51	362
Point 23	51	364
Point 24	41	364
Point 25	41	366
Point 26	31	366
Point 27	31	368
Point 28	26.67	368
Point 29	101	350
Point 30	96	350
Point 31	96	355

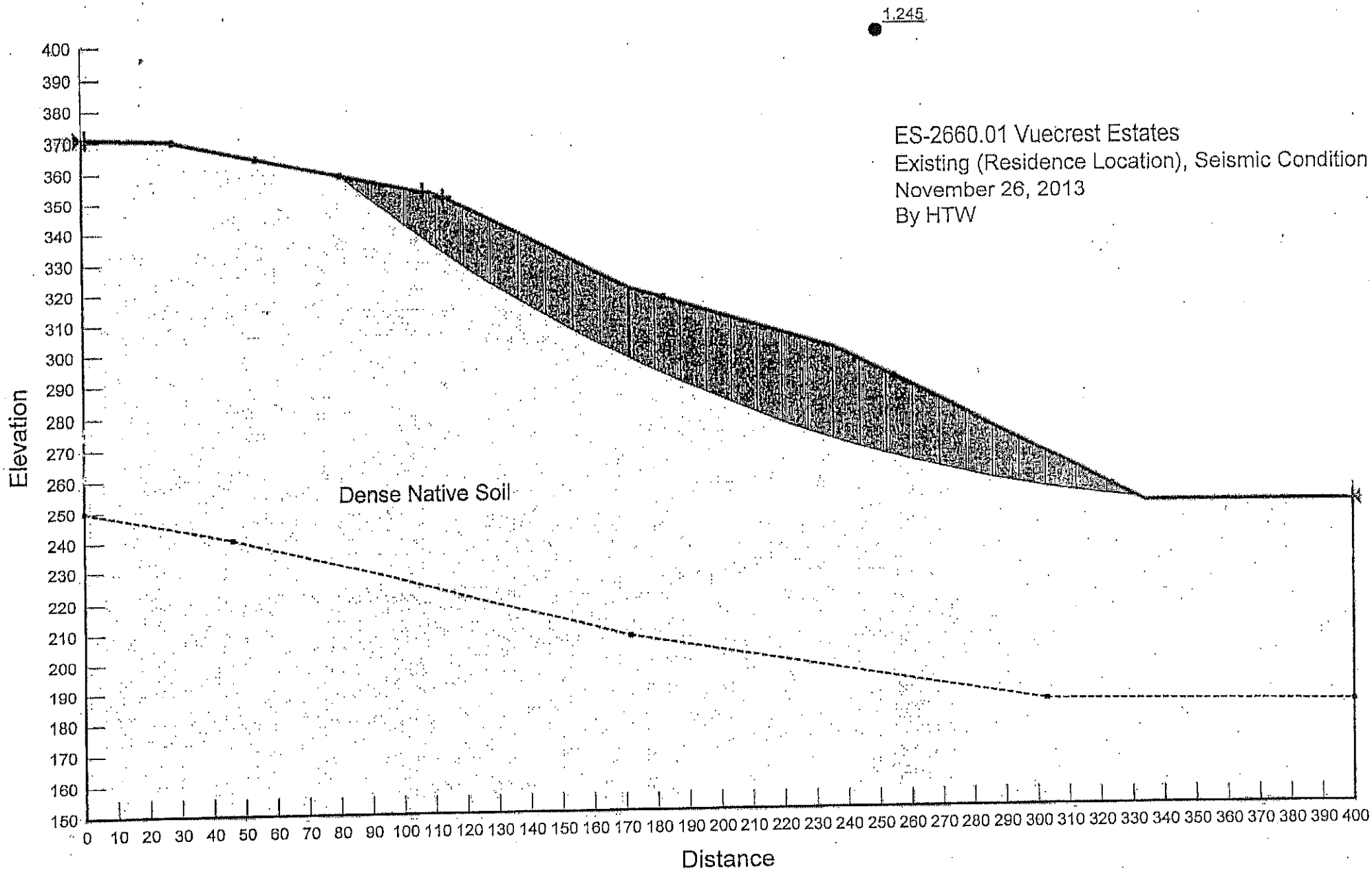
Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	77	1.781	(111.077, 400.633)	48.244	(78.0107, 365.503)	(109.774, 352.406)

Slices of Slip Surface: 77

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	77	78.55193	365.00855	-8307.8397	204.69065	127.90491	0
2	77	79.63437	364.04925	-8265.2677	238.54864	149.06174	0
3	77	80.71681	363.14575	-8226.6917	267.60619	167.21891	0
4	77	81.79925	362.2941	-8191.0762	292.84786	182.99165	0
5	77	82.88169	361.49095	-8158.7432	315.03813	196.85767	0
6	77	83.964135	360.73335	-8129.429	334.74389	209.1712	0
7	77	85.04658	360.0187	-8102.3398	352.38995	220.19768	0
8	77	86.12902	359.3448	-8077.8242	368.25421	230.11077	0
9	77	87.21146	358.7097	-8055.9436	382.50879	239.01802	0
10	77	88.2939	358.1116	-8036.4879	395.19586	246.94578	0

11	77	89.37634	357.549	-8019.0364	406.24064	253.84733	0
12	77	90.45878	357.02055	-8003.7117	415.48241	259.62223	0
13	77	91.5525	356.52015	-7990.3839	238.69777	149.15492	0
14	77	92.657495	356.04735	-7978.9023	241.59862	150.96758	0
15	77	93.76249	355.60665	-7969.4867	241.29175	150.77582	0
16	77	94.86749	355.1971	-7961.93	237.39184	148.33888	0
17	77	95.709995	354.90255	-7957.3932	249.55719	174.74182	200
18	77	96.508365	354.64405	-7954.2588	223.32383	139.54822	0
19	77	97.525095	354.3342	-7951.4927	209.75357	131.06858	0
20	77	98.54182	354.0486	-7950.2931	192.03299	119.99553	0
21	77	99.55854	353.78685	-7950.5525	169.97944	106.21494	0
22	77	100.58385	353.5467	-7952.3034	143.22019	89.493909	0
23	77	101.6429	353.3234	-7955.6988	144.76419	101.36498	200
24	77	102.7271	353.12	-7960.7301	140.74425	98.550182	200
25	77	103.8113	352.94215	-7967.276	130.99465	91.723442	200
26	77	104.89545	352.78955	-7975.4809	115.83552	81.108904	200
27	77	105.9796	352.6619	-7985.1965	95.755219	67.048526	200
28	77	107.0638	352.55905	-7996.5219	71.40231	49.996435	200
29	77	108.148	352.48085	-8009.3465	43.502878	30.461043	200
30	77	109.23215	352.42715	-8023.7168	12.835366	8.9874201	200


1.245
ES-2660.01 Vuecrest Estates
Existing (Residence Location), Seismic Condition
November 26, 2013
By HTW
Dense Native Soil
Elevation
Distance
400
390
380
370
360
350
340
330
320
310
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390 400

Slope Stability

File Information

Title: Vuecrest
Created By: Henry Wright
Revision Number: 19
Last Edited By: Henry Wright
Date: 11/26/2013
Time: 1:36:05 PM
File Name: Vuecrest Existing (Residence), Seismic Condition.gsz
Directory: C:\Users\henry.wright\Documents\SlopeW\Vuecrest Estates\
Last Solved Date: 11/26/2013
Last Solved Time: 1:36:08 PM

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

Slope Stability

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Apply Phreatic Correction: No
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: Piezometric Line
Use Staged Rapid Drawdown: No
Slip Surface
Direction of movement: Left to Right
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: No
Tension Crack
Tension Crack Option: (none)
FOS Distribution

FOS Calculation Option: Constant

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Dense Native Soil

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 200 psf
Phi: 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (1.24812, 370.9532) ft
Left-Zone Right Coordinate: (107.02561, 352.95612) ft
Left-Zone Increment: 4
Right Projection: Range
Right-Zone Left Coordinate: (113.3958, 350.93716) ft
Right-Zone Right Coordinate: (400, 250) ft
Right-Zone Increment: 4
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (0, 371) ft
Right Coordinate: (400, 250) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
	0	249.88736
	46.27953	240.31824
	171.63495	207.50984
	302.86855	184.40726
	400	183.45035

Seismic Loads

Horz Seismic Load: 0.2
Ignore seismic load in strength: No

Regions

	Material	Points	Area (ft^2)
Region 1	Dense Native Soil	10,9,8,3,4,5,6,7,1,2	64129.713

Points

	X (ft)	Y (ft)
Point 1	400	150
Point 2	0	150
Point 3	111.10083	352.14108
Point 4	172.10083	320.14108
Point 5	236	300
Point 6	334	250
Point 7	400	250
Point 8	101.10083	354.14108
Point 9	26.67	370
Point 10	0	371

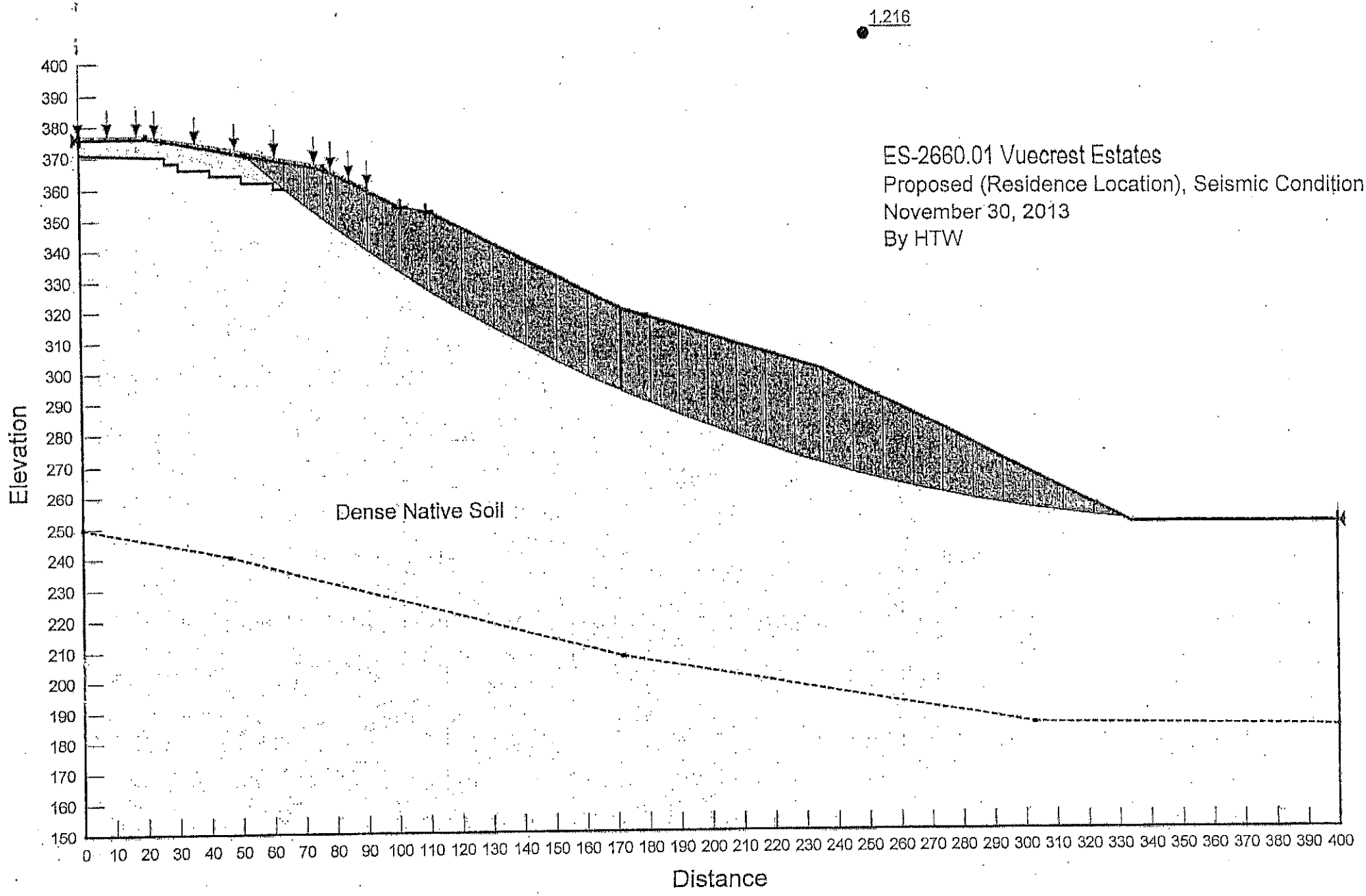
Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	97	1.245	(372.681, 693.708)	444.548	(80.7049, 358.487)	(331.989, 251.026)

Slices of Slip Surface: 97

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	97	85.80389	354.17855	-7750.1264	182.89609	128.06522	200
2	97	96.001835	345.8151	-7395.0085	693.7598	485.77584	200
3	97	106.1008	338.0126	-7073.1077	1141.8951	799.56353	200
4	97	115.4247	331.19685	-6800.0883	1408.4334	986.19571	200
5	97	124.07245	325.2113	-6567.8275	1511.8254	1058.5916	200
6	97	132.72015	319.52135	-6353.9421	1601.3589	1121.2836	200

7	97	141.3679	314.11365	-6157.8067	1680.3893	1176.6213	200
8	97	150.01565	308.97635	-5978.4111	1751.2679	1226.251	200
9	97	158.66335	304.09875	-5815.3076	1815.7317	1271.389	200
10	97	167.3111	299.47115	-5667.7721	1874.4209	1312.4836	200
11	97	171.8679	297.1008	-5593.1267	1905.0373	1333.9215	200
12	97	176.0945	295.0137	-5509.2413	2000.543	1400.7953	200
13	97	184.0819	291.17335	-5357.3289	2192.3612	1535.1078	200
14	97	192.0693	287.52635	-5217.4488	2383.4754	1668.9274	200
15	97	200.0567	284.06755	-5089.3923	2573.0199	1801.6479	200
16	97	208.0441	280.79225	-4972.7354	2758.3796	1931.4382	200
17	97	216.0315	277.69605	-4867.3107	2936.0632	2055.8536	200
18	97	224.0189	274.775	-4772.758	3101.5671	2171.7407	200
19	97	232.0063	272.0255	-4688.9979	3248.9974	2274.9725	200
20	97	240.1793	269.38815	-4614.1102	3286.9996	2301.5819	200
21	97	248.53785	266.8676	-4548.6951	3200.606	2241.0884	200
22	97	256.8964	264.5246	-4494.3075	3066.511	2147.1941	200
23	97	265.255	262.3563	-4450.8388	2881.3954	2017.5748	200
24	97	273.61355	260.36005	-4418.1356	2644.9099	1851.9859	200
25	97	281.9721	258.53345	-4395.8811	2359.1568	1651.8994	200
26	97	290.3307	256.87445	-4384.187	2028.8519	1420.6174	200
27	97	298.6893	255.38115	-4382.8931	1660.8821	1162.9621	200
28	97	307.722	253.95875	-4342.9891	1229.4978	860.90365	200
29	97	317.4288	252.6338	-4266.3217	740.9841	518.84266	200
30	97	327.1356	251.5259	-4203.1494	237.93423	166.60334	200


1.216
ES-2660.01 Vuecrest Estates
Proposed (Residence Location), Seismic Condition
November 30, 2013
By HTW
Dense Native Soil
Elevation
Distance
400
390
380
370
360
350
340
330
320
310
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390 400

Slope Stability

File Information

Title: Vuecrest
Created By: Henry Wright
Revision Number: 21
Last Edited By: Henry Wright
Date: 11/30/2013
Time: 1:25:05 PM
File Name: Vuecrest Proposed (Residence), Seismic Condition.gsz
Directory: C:\Users\henry.wright\Documents\SlopeW\Vuecrest Estates\
Last Solved Date: 11/30/2013
Last Solved Time: 1:25:10 PM

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

Slope Stability

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Apply Phreatic Correction: No
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: Piezometric Line
Use Staged Rapid Drawdown: No
Slip Surface
Direction of movement: Left to Right
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: No
Tension Crack
Tension Crack Option: (none)
FOS Distribution
FOS Calculation Option: Constant

Advanced
- Number of Slices: 30
- Optimization Tolerance: 0.01
- Minimum Slip Surface Depth: 0.1 ft
- Optimization Maximum Iterations: 2000
- Optimization Convergence Tolerance: 1e-007
- Starting Optimization Points: 8
- Ending Optimization Points: 16
- Complete Passes per Insertion: 1
- Driving Side Maximum Convex Angle: 5 °
- Resisting Side Maximum Convex Angle: 1 °

Materials

Dense Native Soil
- Model: Mohr-Coulomb
- Unit Weight: 125 pcf
- Cohesion: 200 psf
- Phi: 35 °
- Phi-B: 0 °
- Pore Water Pressure
  - Piezometric Line: 1

Select Fill Soil
- Model: Mohr-Coulomb
- Unit Weight: 130 pcf
- Cohesion: 0 psf
- Phi: 32 °
- Phi-B: 0 °
- Pore Water Pressure
  - Piezometric Line: 1

Slip Surface Entry and Exit
- Left Projection: Range
- Left-Zone Left Coordinate: (0.18509, 376) ft
- Left-Zone Right Coordinate: (101.63203, 354.03484) ft
- Left-Zone Increment: 4
- Right Projection: Range
- Right-Zone Left Coordinate: (109.77425, 352.4064) ft
- Right-Zone Right Coordinate: (400, 250) ft
- Right-Zone Increment: 4
- Radius Increments: 4

Slip Surface Limits
- Left Coordinate: (0, 376) ft
- Right Coordinate: (400, 250) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
	0	249.88736
	46.27953	240.31824
	171.63495	207.50984
	302.86855	184.40726
	400	183.45035

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 250 pcf
Direction: Vertical

Coordinates

	X (ft)	Y (ft)
	0	377
	21	377
	77	367
	91	360

Seismic Loads

Horz Seismic Load: 0.2
Ignore seismic load in strength: No

Regions

	Material	Points	Area (ft²)
Region 1	Dense Native Soil	10,9,28,27,26,25,24,23,22,20,21,19,18,17,16,15,14,31,30,29,8,3,4,5,6,7,1,2	63994.441
Region 2	Select Fill Soil	13,10,9,28,27,26,25,24,23,22,20,21,19,18,17,16,15,14,31,30,29,8,11,12	654.8246

Points

	X (ft)	Y (ft)
Point 1	400	150
Point 2	0	150
Point 3	111.10083	352.14108

Point 4	172.10083	320.14108
Point 5	236	300
Point 6	334	250
Point 7	400	250
Point 8	101.10083	354.14108
Point 9	26.67	370
Point 10	0	371
Point 11	77	366
Point 12	21	376
Point 13	0	376
Point 14	91	355
Point 15	91	356
Point 16	81	356
Point 17	81	358
Point 18	71	358
Point 19	71	360
Point 20	61	362
Point 21	61	360
Point 22	51	362
Point 23	51	364
Point 24	41	364
Point 25	41	366
Point 26	31	366
Point 27	31	368
Point 28	26.67	368
Point 29	101	350
Point 30	96	350
Point 31	96	355

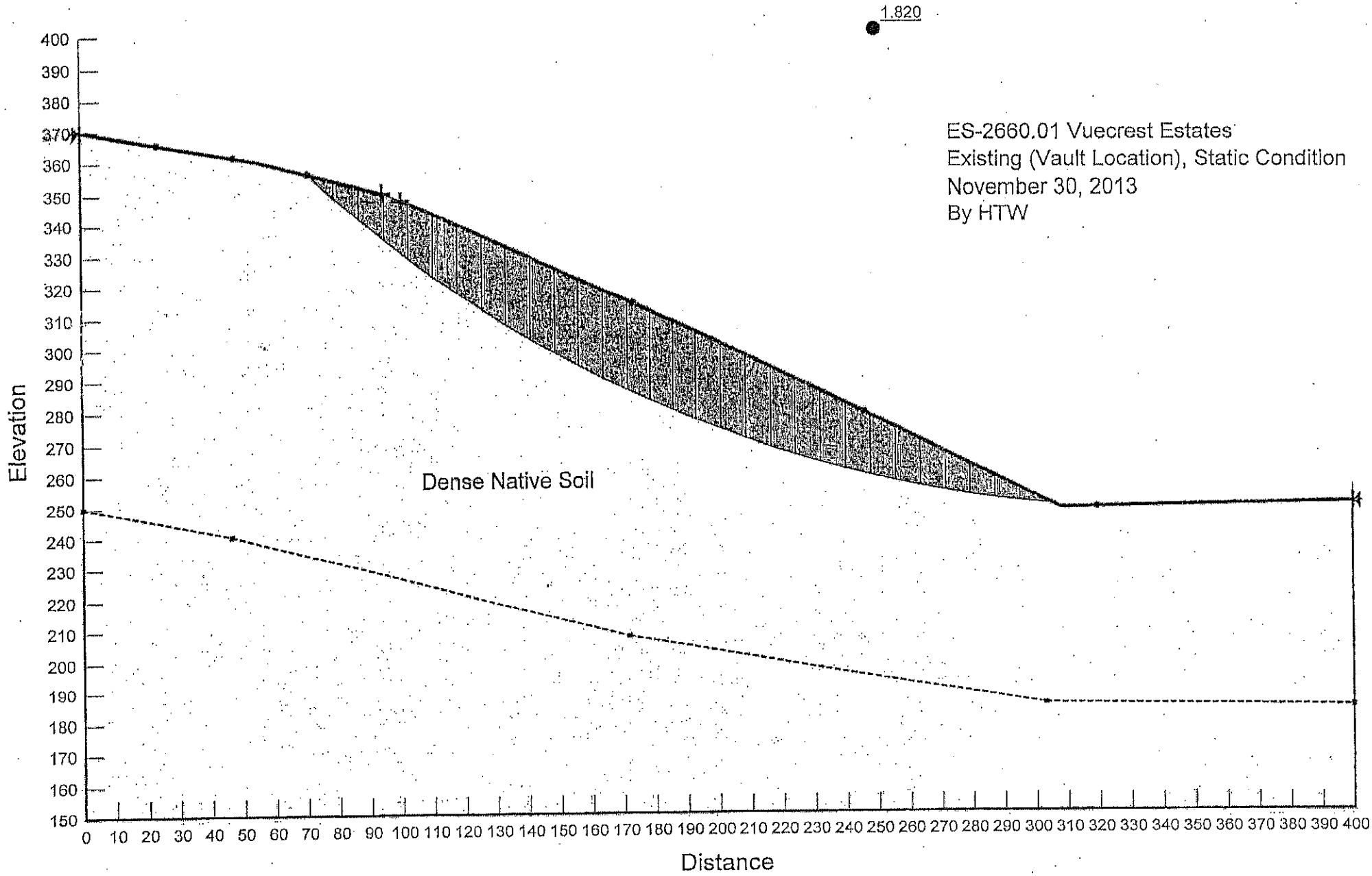
Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	72	1.216	(373.986, 737.223)	487.917	(52.2423, 370.421)	(331.774, 251.135)

Slices of Slip Surface: 72

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	72	58.384165	365.2105	-7990.7875	525.13106	328.13831	0
2	72	67.762995	357.3903	-7656.1381	926.02858	648.4122	200
3	72	74	352.4417	-7449.2718	1229.7594	861.08683	200
4	72	79	348.58475	-7290.2945	1400.6884	980.77258	200
5	72	86	343.41035	-7081.6083	1512.2004	1058.8541	200
6	72	93.5	337.99755	-6866.3446	1471.2286	1030.1654	200
7	72	98.5504	334.4968	-6730.4118	1555.5744	1089.2249	200
8	72	106.1008	329.4676	-6539.8971	1757.6235	1230.7012	200
9	72	116.14535	323.04235	-6303.0322	1988.3409	1392.2513	200

10	72	126.2344	316.9284	-6086.2764	2078.2261	1455.1896	200
11	72	136.3234	311.141	-5889.8686	2161.1997	1513.2883	200
12	72	146.4124	305.6671	-5713.1159	2238.4985	1567.4135	200
13	72	156.5014	300.4949	-5555.1514	2310.0401	1617.5075	200
14	72	166.59045	295.6137	-5415.2791	2374.1638	1662.4074	200
15	72	171.8679	293.13855	-5345.759	2406.5	1685.0494	200
16	72	176.66505	291.01415	-5265.9068	2515.7328	1761.5351	200
17	72	185.7935	287.08755	-5121.2189	2733.9445	1914.3286	200
18	72	194.92195	283.3785	-4989.9738	2945.9066	2062.746	200
19	72	204.0504	279.88175	-4872.1259	3147.1761	2203.6764	200
20	72	213.17885	276.5924	-4767.1248	3331.7747	2332.9338	200
21	72	222.3073	273.5061	-4674.8482	3492.4705	2445.4542	200
22	72	231.43575	270.6188	-4594.8905	3621.9153	2536.0924	200
23	72	240.77635	267.8688	-4525.909	3609.6898	2527.532	200
24	72	250.329	265.26175	-4468.2111	3439.4613	2408.3367	200
25	72	259.88165	262.8614	-4423.3516	3207.1844	2245.6947	200
26	72	269.4343	260.6646	-4391.1752	2913.2372	2039.8707	200
27	72	278.98695	258.66855	-4371.574	2561.7475	1793.7549	200
28	72	288.5396	256.87075	-4364.2905	2159.8317	1512.3304	200
29	72	298.09225	255.269	-4369.3284	1716.9983	1202.2551	200
30	72	307.68625	253.8561	-4336.5179	1241.987	869.64863	200
31	72	317.32155	252.63195	-4266.0638	745.42984	521.9556	200
32	72	326.95685	251.602	-4207.7772	239.18413	167.47853	200


1.820
ES-2660.01 Vuecrest Estates
Existing (Vault Location), Static Condition
November 30, 2013
By HTW
Dense Native Soil
Elevation
Distance
400
390
380
370
360
350
340
330
320
310
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390 400

Slope Stability

File Information

Title: Vuecrest
Created By: Henry Wright
Revision Number: 13
Last Edited By: Henry Wright
Date: 11/30/2013
Time: 1:47:39 PM
File Name: Vuecrest Existing, Static Condition.gsz
Directory: C:\Users\henry.wright\Documents\SlopeW\Vuecrest Estates\
Last Solved Date: 11/30/2013
Last Solved Time: 1:47:40 PM

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

Slope Stability

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Apply Phreatic Correction: No
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: Piezometric Line
Use Staged Rapid Drawdown: No
Slip Surface
Direction of movement: Left to Right
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: No
Tension Crack
Tension Crack Option: (none)
FOS Distribution

FOS Calculation Option: Constant

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Dense Native Soil

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 200 psf
Phi: 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (0, 370) ft
Left-Zone Right Coordinate: (94.35876, 350.16031) ft
Left-Zone Increment: 4
Right Projection: Range
Right-Zone Left Coordinate: (100.25406, 347.58742) ft
Right-Zone Right Coordinate: (400, 250) ft
Right-Zone Increment: 4
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (0, 370) ft
Right Coordinate: (400, 250) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
	0	249.88736
	46.27953	240.31824
	171.63495	207.50984
	302.86855	184.40726
	400	183.45035

Seismic Loads

Horz Seismic Load: 0

Regions

	Material	Points	Area (ft^2)
Region 1	Dense Native Soil	8,5,4,6,9,1,2,3	61110.399

Points

	X (ft)	Y (ft)
Point 1	400	250
Point 2	400	150
Point 3	0	150
Point 4	95	350
Point 5	55	360
Point 6	193	305
Point 7	304	250
Point 8	0	370
Point 9	307.86636	248.3727

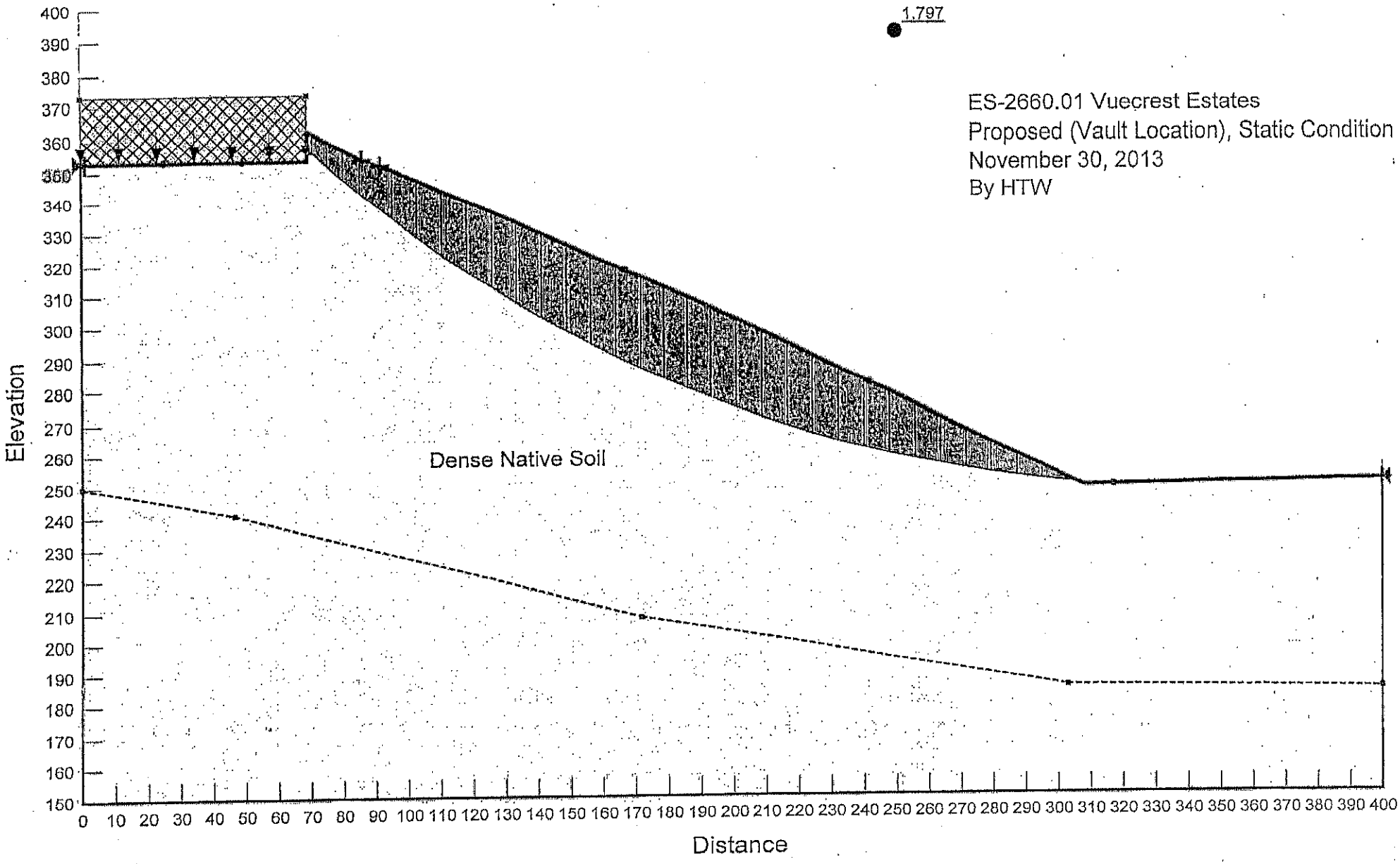
Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	92	1.820	(338.979, 634.837)	386.754	(70.9609, 356.01)	(305.51, 249.535)

Slices of Slip Surface: 92

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	92	74.96743	352.2664	-7454.1094	177.09711	124.00473	200
2	92	82.980455	344.98445	-7130.5836	658.49769	461.08504	200
3	92	90.993485	338.09765	-6831.7057	1095.398	767.00592	200
4	92	98.83175	331.71375	-6561.2966	1417.3014	992.40514	200
5	92	106.49525	325.7956	-6317.2144	1632.6674	1143.2061	200
6	92	114.15875	320.17535	-6091.6897	1828.197	1280.1174	200
7	92	121.82225	314.83735	-5883.7261	2007.0231	1405.3327	200
8	92	129.48575	309.7677	-5692.5149	2171.6431	1520.6008	200

9	92	137.14925	304.95395	-5517.3403	2323.5652	1626.9778	200
10	92	144.81275	300.3851	-5357.324	2463.8522	1725.2079	200
11	92	152.47625	296.0512	-5212.058	2592.826	1815.5163	200
12	92	160.13975	291.9433	-5080.8752	2710.1086	1897.6385	200
13	92	167.80325	288.05345	-4963.3424	2814.7995	1970.9438	200
14	92	175.1958	284.4974	-4843.0998	2903.0105	2032.7099	200
15	92	182.31745	281.255	-4719.0994	2973.6527	2082.174	200
16	92	189.43915	278.1843	-4605.7212	3028.7405	2120.7469	200
17	92	196.9239	275.1416	-4497.9631	3052.6464	2137.486	200
18	92	204.77165	272.14	-4396.9862	3039.756	2128.46	200
19	92	212.6194	269.33155	-4307.9481	2997.8964	2099.1497	200
20	92	220.46715	266.7118	-4230.6272	2924.2866	2047.6075	200
21	92	228.3149	264.27675	-4164.8383	2816.1589	1971.8957	200
22	92	236.16265	262.02275	-4110.4457	2671.5072	1870.6095	200
23	92	244.0104	259.9466	-4067.1255	2489.6105	1743.244	200
24	92	251.85815	258.04535	-4034.6139	2270.3238	1589.6979	200
25	92	259.7059	256.3163	-4012.9663	2014.9641	1410.893	200
26	92	267.55365	254.75715	-4001.9431	1725.9601	1208.5303	200
27	92	275.4014	253.3658	-4001.2569	1407.1141	985.27192	200
28	92	283.24915	252.1404	-4011.0822	1062.4639	743.94526	200
29	92	291.0969	251.0794	-4031.0528	697.15211	488.15117	200
30	92	298.9447	250.18145	-4061.1426	316.2173	221.41773	200
31	92	304.18915	249.6538	-4072.1931	56.876459	39.825326	200


1.797
ES-2660.01 Vuecrest Estates
Proposed (Vault Location), Static Condition
November 30, 2013
By HTW
Dense Native Soil
Elevation
Distance
400
390
380
370
360
350
340
330
320
310
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390 400

Slope Stability

File Information

Title: Vuecrest
Created By: Henry Wright
Revision Number: 17
Last Edited By: Henry Wright
Date: 11/30/2013
Time: 2:09:39 PM
File Name: Vuecrest Vault, Static Condition.gsz
Directory: C:\Users\henry.wright\Documents\SlopeW\Vuecrest Estates\
Last Solved Date: 11/30/2013
Last Solved Time: 2:09:42 PM

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

Slope Stability

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Apply Phreatic Correction: No
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: Piezometric Line
Use Staged Rapid Drawdown: No
Slip Surface
Direction of movement: Left to Right
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: No
Tension Crack
Tension Crack Option: (none)
FOS Distribution

FOS Calculation Option: Constant

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Dense Native Soil

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 200 psf
Phi: 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Select Fill Soil

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion: 0 psf
Phi: 32 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Vault

Model: (None)
Pore Water Pressure
Piezometric Line: 1

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (1.24453, 353) ft
Left-Zone Right Coordinate: (85.73941, 353.24121) ft
Left-Zone Increment: 4
Right Projection: Range
Right-Zone Left Coordinate: (91.40842, 351.25705) ft
Right-Zone Right Coordinate: (400, 250) ft
Right-Zone Increment: 4
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (0, 353) ft
Right Coordinate: (400, 250) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
	0	249.88736
	46.27953	240.31824
	171.63495	207.50984
	302.86855	184.40726
	400	183.45035

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 71.5 pcf
Direction: Vertical

Coordinates

	X (ft)	Y (ft)
	0	353
	0	373
	69	373

Seismic Loads

Horz Seismic Load: 0

Regions

	Material	Points	Area (ft²)
Region 1	Select Fill Soil	14,13,11,10,17,16,15,9	76
Region 2	Dense Native Soil	7,12,13,11,10,17,16,15,9,4,5,6,8,1,2,3	60341.89
Region 3	Vault	18,19,14,13,12,7	1380

Points

	X (ft)	Y (ft)
Point 1	400	250

Point 2	400	150
Point 3	0	150
Point 4	95	350
Point 5	193	305
Point 6	304	250
Point 7	0	353
Point 8	307.86636	248.3727
Point 9	85	353.5
Point 10	75	353.5
Point 11	75	355.5
Point 12	69	353
Point 13	69	355.5
Point 14	69	362
Point 15	85	349.5
Point 16	80	349.5
Point 17	80	353.5
Point 18	0	373
Point 19	69	373

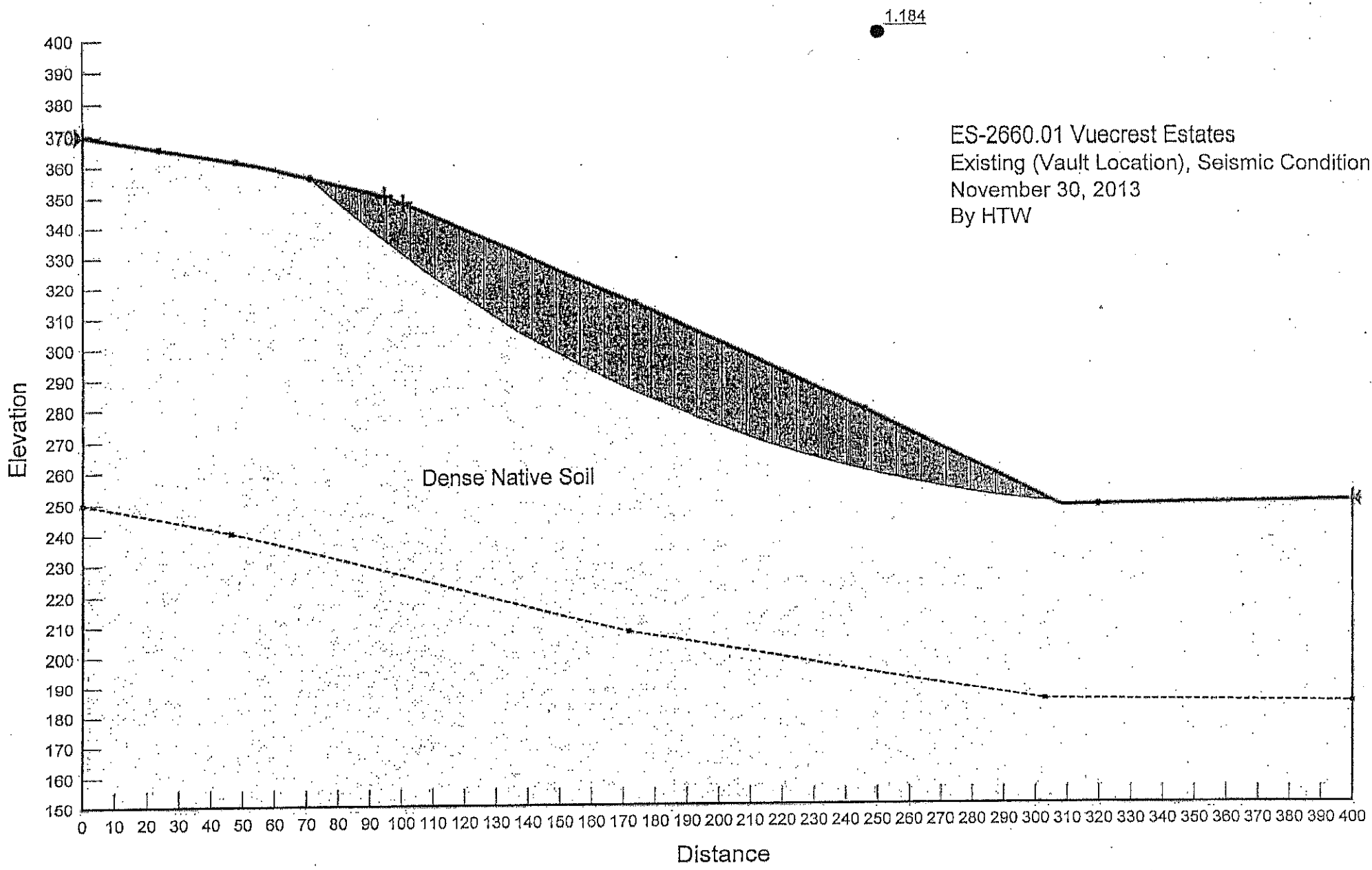
Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	92	1.797	(338.858, 636.306)	388.384	(69, 362)	(305.535, 249.354)

Slices of Slip Surface: 92

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	92	69.7738	356.24345	-7617.3187	518.22742	323.82443	0
2	92	72.7738	353.40615	-7489.4051	534.29375	374.11651	200
3	92	77.5	349.0378	-7293.9671	698.18229	488.8725	200
4	92	82.5	344.5665	-7096.645	863.1477	604.38253	200
5	92	90	338.19575	-6821.5474	1133.6236	793.77177	200
6	92	98.83175	331.0093	-6517.3999	1459.1163	1021.6843	200
7	92	106.49525	325.1355	-6275.9955	1671.4101	1170.334	200
8	92	114.15875	319.556	-6053.047	1865.0631	1305.9312	200
9	92	121.82225	314.2555	-5847.4406	2043.0008	1430.5246	200
10	92	129.48575	309.22045	-5658.3798	2207.4781	1545.6928	200
11	92	137.14925	304.4388	-5485.1781	2359.9502	1652.4549	200
12	92	144.81275	299.89965	-5327.1189	2501.301	1751.4298	200
13	92	152.47625	295.5933	-5183.5151	2631.7681	1842.7839	200
14	92	160.13975	291.5111	-5053.9952	2750.7636	1926.1054	200
15	92	167.80325	287.64515	-4937.8597	2857.5154	2000.8538	200
16	92	175.1958	284.1106	-4819.0218	2947.646	2063.964	200
17	92	182.31745	280.88755	-4696.0616	3020.1084	2114.7026	200
18	92	189.43915	277.835	-4583.842	3076.7616	2154.3716	200

19	92	196.9239	274.81015	-4477.2995	3101.0648	2171.389	200
20	92	204.77165	271.826	-4377.3251	3086.8376	2161.4269	200
21	92	212.6194	269.0338	-4289.2657	3043.1204	2130.8159	200
22	92	220.46715	266.4291	-4213.0059	2966.762	2077.3491	200
23	92	228.3149	264.00805	-4148.1084	2854.9853	1999.0822	200
24	92	236.16265	261.7671	-4094.5481	2706.1449	1894.8631	200
25	92	244.0104	259.703	-4051.8678	2519.1494	1763.9274	200
26	92	251.85815	257.81285	-4020.1674	2294.2226	1606.4319	200
27	92	259.7059	256.09405	-3999.1252	2032.8086	1423.3879	200
28	92	267.55365	254.5443	-3988.619	1737.7166	1216.7623	200
29	92	275.4014	253.16155	-3988.4817	1412.6318	989.13543	200
30	92	283.24915	251.944	-3998.7586	1062.3547	743.86875	200
31	92	291.0969	250.89005	-4019.2069	691.90097	484.47428	200
32	92	298.9447	249.9984	-4049.7982	306.60892	214.68988	200
33	92	303.4343	249.54115	-4064.7394	83.084988	58.176735	200
34	92	304.7673	249.4217	-4058.0532	22.613837	15.834379	200


1.184
ES-2660.01 Vuecrest Estates
Existing (Vault Location), Seismic Condition
November 30, 2013
By HTW
Dense Native Soil
Elevation
Distance
400
390
380
370
360
350
340
330
320
310
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390 400

Slope Stability

File Information

Title: Vuecrest
Created By: Henry Wright
Revision Number: 15
Last Edited By: Henry Wright
Date: 11/30/2013
Time: 2:10:42 PM
File Name: Vuecrest Existing, Seismic Condition.gsz
Directory: C:\Users\henry.wright\Documents\SlopeW\Vuecrest Estates\
Last Solved Date: 11/30/2013
Last Solved Time: 2:10:44 PM

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

Slope Stability

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Apply Phreatic Correction: No
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: Piezometric Line
Use Staged Rapid Drawdown: No
Slip Surface
Direction of movement: Left to Right
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: No
Tension Crack
Tension Crack Option: (none)
FOS Distribution

FOS Calculation Option: Constant

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Dense Native Soil

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 200 psf
Phi: 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (0, 370) ft
Left-Zone Right Coordinate: (94.35876, 350.16031) ft
Left-Zone Increment: 4
Right Projection: Range
Right-Zone Left Coordinate: (100.25406, 347.58742) ft
Right-Zone Right Coordinate: (400, 250) ft
Right-Zone Increment: 4
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (0, 370) ft
Right Coordinate: (400, 250) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
	0	249.88736
	46.27953	240.31824
	171.63495	207.50984
	302.86855	184.40726
	400	183.45035

Seismic Loads

Horz Seismic Load: 0.2
Ignore seismic load in strength: No

Regions

	Material	Points	Area (ft²)
Region 1	Dense Native Soil	8,5,4,6,9,1,2,3	61110.399

Points

	X (ft)	Y (ft)
Point 1	400	250
Point 2	400	150
Point 3	0	150
Point 4	95	350
Point 5	55	360
Point 6	193	305
Point 7	304	250
Point 8	0	370
Point 9	307.86636	248.3727

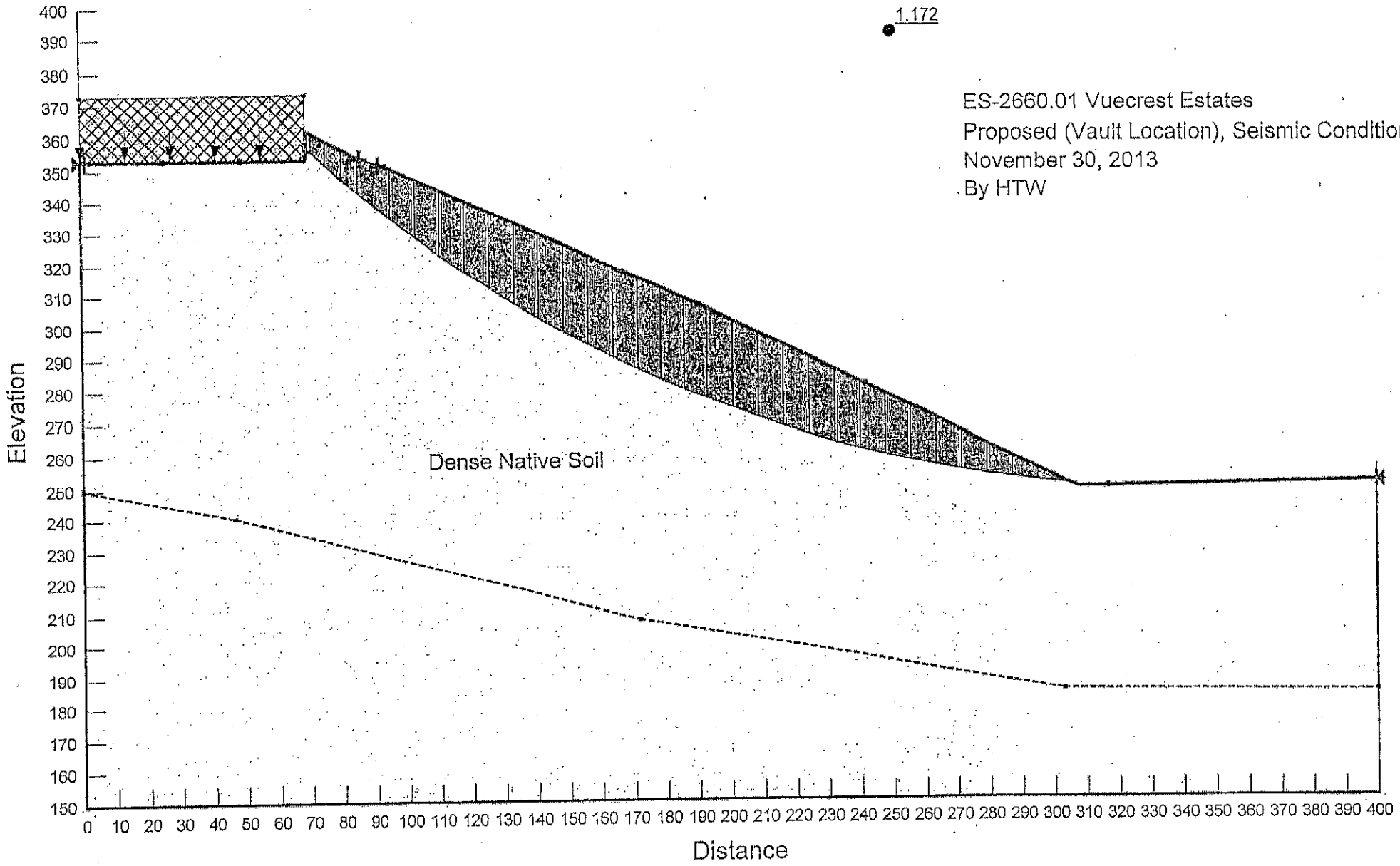
Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	92	1.184	(338.979, 634.837)	386.754	(70.9609, 356.01)	(305.51, 249.535)

Slices of Slip Surface: 92

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	92	74.96743	352.2664	-7454.1094	122.39315	85.700606	200
2	92	82.980455	344.98445	-7130.5836	542.11779	379.59496	200
3	92	90.993485	338.09765	-6831.7057	912.1709	638.70894	200
4	92	98.83175	331.71375	-6561.2966	1176.7376	823.96054	200
5	92	106.49525	325.7956	-6317.2144	1348.1994	944.01936	200
6	92	114.15875	320.17535	-6091.6897	1502.9884	1052.4038	200
7	92	121.82225	314.83735	-5883.7261	1645.7416	1152.3607	200

8	92	129.48575	309.7677	-5692.5149	1780.3985	1246.6485	200
9	92	137.14925	304.95395	-5517.3403	1910.1653	1337.5122	200
10	92	144.81275	300.3851	-5357.324	2037.5052	1426.6765	200
11	92	152.47625	296.0512	-5212.058	2164.0415	1515.2781	200
12	92	160.13975	291.9433	-5080.8752	2290.5879	1603.8869	200
13	92	167.80325	288.05345	-4963.3424	2416.7305	1692.2129	200
14	92	175.1958	284.4974	-4843.0998	2537.0496	1776.4612	200
15	92	182.31745	281.255	-4719.0994	2648.9811	1854.8365	200
16	92	189.43915	278.1843	-4605.7212	2753.8242	1928.2485	200
17	92	196.9239	275.1416	-4497.9631	2838.6044	1987.6122	200
18	92	204.77165	272.14	-4396.9862	2894.6756	2026.8737	200
19	92	212.6194	269.33155	-4307.9481	2921.4225	2045.6021	200
20	92	220.46715	266.7118	-4230.6272	2911.0655	2038.35	200
21	92	228.3149	264.27675	-4164.8383	2856.817	2000.3648	200
22	92	236.16265	262.02275	-4110.4457	2753.0724	1927.7221	200
23	92	244.0104	259.9466	-4067.1255	2596.5816	1818.146	200
24	92	251.85815	258.04535	-4034.6139	2387.1486	1671.4995	200
25	92	259.7059	256.3163	-4012.9663	2127.3361	1489.5768	200
26	92	267.55365	254.75715	-4001.9431	1822.3894	1276.0508	200
27	92	275.4014	253.3658	-4001.2569	1480.2665	1036.4937	200
28	92	283.24915	252.1404	-4011.0822	1109.9513	777.19628	200
29	92	291.0969	251.0794	-4031.0528	720.7846	504.69881	200
30	92	298.9447	250.18145	-4061.1426	321.46435	225.09176	200
31	92	304.18915	249.6538	-4072.1931	53.629716	37.551931	200


1.172
ES-2660.01 Vuecrest Estates
Proposed (Vault Location), Seismic Condition
November 30, 2013
By HTW
Dense Native Soil
Elevation
Distance
400
390
380
370
360
350
340
330
320
310
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390 400

Slope Stability

File Information

Title: Vuecrest
Created By: Henry Wright
Revision Number: 18
Last Edited By: Henry Wright
Date: 11/30/2013
Time: 2:11:32 PM
File Name: Vuecrest Vault, Seismic Condition.gsz
Directory: C:\Users\henry.wright\Documents\SlopeW\Vuecrest Estates\
Last Solved Date: 11/30/2013
Last Solved Time: 2:11:36 PM

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

Slope Stability

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Apply Phreatic Correction: No
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: Piezometric Line
Use Staged Rapid Drawdown: No
Slip Surface
Direction of movement: Left to Right
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: No
Tension Crack
Tension Crack Option: (none)
FOS Distribution

FOS Calculation Option: Constant

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Dense Native Soil

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 200 psf
Phi: 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Select Fill Soil

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion: 0 psf
Phi: 32 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Vault

Model: (None)
Pore Water Pressure
Piezometric Line: 1

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (1.24453, 353) ft
Left-Zone Right Coordinate: (85.73941, 353.24121) ft
Left-Zone Increment: 4
Right Projection: Range
Right-Zone Left Coordinate: (91.40842, 351.25705) ft
Right-Zone Right Coordinate: (400, 250) ft
Right-Zone Increment: 4
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (0, 353) ft
Right Coordinate: (400, 250) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
	0	249.88736
	46.27953	240.31824
	171.63495	207.50984
	302.86855	184.40726
	400	183.45035

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 71.5 pcf
Direction: Vertical

Coordinates

	X (ft)	Y (ft)
	0	353
	0	373
	69	373

Seismic Loads

Horz Seismic Load: 0.2
Ignore seismic load in strength: No

Regions

	Material	Points	Area (ft^2)
Region 1	Select Fill Soil	14,13,11,10,17,16,15,9	76
Region 2	Dense Native Soil	7,12,13,11,10,17,16,15,9,4,5,6,8,1,2,3	60341.89
Region 3	Vault	18,19,14,13,12,7	1380

Points

	X (ft)	Y (ft)

Point 1	400	250
Point 2	400	150
Point 3	0	150
Point 4	95	350
Point 5	193	305
Point 6	304	250
Point 7	0	353
Point 8	307.86636	248.3727
Point 9	85	353.5
Point 10	75	353.5
Point 11	75	355.5
Point 12	69	353
Point 13	69	355.5
Point 14	69	362
Point 15	85	349.5
Point 16	80	349.5
Point 17	80	353.5
Point 18	0	373
Point 19	69	373

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	92	1.172	(338.858, 636.306)	388.384	(69, 362)	(305.535, 249.354)

Slices of Slip Surface: 92

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	92	69.7738	356.24345	-7617.3187	455.73913	284.77741	0
2	92	72.7738	353.40615	-7489.4051	429.12992	300.48001	200
3	92	77.5	349.0378	-7293.9671	570.67655	399.59202	200
4	92	82.5	344.5665	-7096.645	710.73119	497.65934	200
5	92	90	338.19575	-6821.5474	936.10115	655.46509	200
6	92	98.83175	331.0093	-6517.3999	1202.8683	842.25742	200
7	92	106.49525	325.1355	-6275.9955	1372.3839	960.95357	200
8	92	114.15875	319.556	-6053.047	1526.6186	1068.9499	200
9	92	121.82225	314.2555	-5847.4406	1669.8935	1169.272	200
10	92	129.48575	309.22045	-5658.3798	1806.2284	1264.7347	200
11	92	137.14925	304.4388	-5485.1781	1938.4508	1357.3179	200
12	92	144.81275	299.89965	-5327.1189	2068.9509	1448.695	200
13	92	152.47625	295.5933	-5183.5151	2199.1503	1539.8616	200
14	92	160.13975	291.5111	-5053.9952	2329.7615	1631.3165	200
15	92	167.80325	287.64515	-4937.8597	2460.2608	1722.6931	200
16	92	175.1958	284.1106	-4819.0218	2584.7295	1809.8471	200
17	92	182.31745	280.88755	-4696.0616	2700.5181	1890.9232	200

18	92	189.43915	277.835	-4583.842	2808.8621	1966.7864	200
19	92	196.9239	274.81015	-4477.2995	2895.3947	2027.3772	200
20	92	204.77165	271.826	-4377.3251	2951.343	2066.5526	200
21	92	212.6194	269.0338	-4289.2657	2976.481	2084.1544	200
22	92	220.46715	266.4291	-4213.0059	2963.2425	2074.8848	200
23	92	228.3149	264.00805	-4148.1084	2904.4577	2033.7232	200
24	92	236.16265	261.7671	-4094.5481	2794.9939	1957.0758	200
25	92	244.0104	259.703	-4051.8678	2631.842	1842.8356	200
26	92	251.85815	257.81285	-4020.1674	2414.9319	1690.9535	200
27	92	259.7059	256.09405	-3999.1252	2147.4543	1503.6637	200
28	92	267.55365	254.5443	-3988.619	1835.1681	1284.9985	200
29	92	275.4014	253.16155	-3988.4817	1486.0479	1040.542	200
30	92	283.24915	251.944	-3998.7586	1109.6088	776.95647	200
31	92	291.0969	250.89005	-4019.2069	715.28301	500.84656	200
32	92	298.9447	249.9984	-4049.7982	311.85639	218.36419	200
33	92	303.4343	249.54115	-4064.7394	80.907527	56.652061	200
34	92	304.7673	249.4217	-4058.0532	18.813814	13.173574	200

Elizabeth Higgins

From: Maire Thornton <mthornton@aesgeo.com>
Sent: Monday, November 18, 2013 11:21 AM
To: Elizabeth Higgins
Subject: RE: Vuecrest in Renton

Good morning Elizabeth:

Thank you for the positive input. Your thoughtfulness has brightened this cold gray day and has put a positive perspective on the start of the week for me.

The second sentence means that the conditions have not been met and that they should demonstrate satisfaction of each of the three conditions by providing the results of stability analyses for existing and proposed site conditions.

The changes indicated in red (see below) may clarify the intent. The sentence may have been clearer if it had been written as follows:
The results of stability analyses which demonstrate satisfaction of each of the three conditions listed above are required for both existing and proposed site conditions.

Text taken from report:

- *The proposal will not increase the threat of the geological hazard to adjacent or abutting properties beyond pre-development conditions; and (Ord. 5676, 12-3-2012)*
- *The proposal will not adversely impact other critical areas; and*
- *The development can be safely accommodated on the site.*

The three conditions listed above have not been satisfied by the referenced reports. The results of ~~the~~ stability analyses before and after development demonstrating how the three conditions as listed above are satisfied ~~as~~ are required.

Hope that helps!

Please make a note: AESI Tacoma has not moved but our street name has changed to Commerce Street

Maire Thornton, P.E.
Associated Earth Sciences, Inc.
1552 Commerce Street, Suite 102 | Tacoma, Washington 98402
C| 425-766-7340 O|253-722-2992 F| 253-722-2993

EXHIBIT 22

Associated Earth Sciences, Inc.

Serving the Pacific Northwest Since 1981

(Peer Review)

October 31, 2013
Project No. TE130415A

Geonerco Properties WA, LLC
1441 N 34th Street Suite 200
Seattle, Washington 98103-8904

Attention: Mr. Jamie Waltier

Subject: Geotechnical Review
Vuecrest Preliminary Plat
LUA13-000642

Reference: "Geotechnical Engineering Study, Proposed Smithers Avenue Residential Plat, 47XXS Smithers Avenue S, Renton, Washington." Earth Solutions NW L.L.C. Report date: February 25, 2013

"Slope Setback, Smithers Avenue Residential Plat, Renton, Washington." Earth Solutions NW L.L.C. Report date: April 10, 2013

"Slope Setback Response, Viewcrest Estates Residential Plat, Renton, Washington." Earth Solutions NW L.L.C. Report date: July 15, 2013.

Renton Municipal Code, Code Publishing Company, eLibrary, current through Ordinance 5691, passed May 20, 2013; City Website: http://rentonwa.gov/

Dear Mr. Waltier:

As requested, Associated Earth Sciences, Inc. (AESI) has completed geotechnical review of the above-referenced documents prepared by Earth Solutions NW, LLC (ESNW) which are being used to support a request by the Geonerco Properties WA, LLC (Geonerco) to obtain permits for a 21-lot residential subdivision from the City of Renton. Authorization to proceed with this review was granted by Mr. Jamie Waltier of Geonerco and was accomplished in general accordance with our proposal dated August 14, 2013.

The purpose of our review is to check for compliance with minimum code standards, completeness, to note obvious factual errors, consistency of data with conclusions and standards of practice. To date, our services have included review of published and unpublished literature we have in our files, review of the referenced reports, review of the "Vuecrest Estates, Preliminary Plat, Conceptual Road and Grading Plan," Sheet C4, dated September 20, 2013 by D. R. Strong Consulting Engineers (DRS), and preparation of this letter.

EXHIBIT 23

Site and Project Description

Based on available information and the description provided in the February 25, 2013 ESNW report, the 5.3 acre site consists of an undeveloped, wooded parcel located south of South 47th Street at the intersection with Smithers Avenue South where it enters into the site in Renton, Washington. Wetland tracts are mapped east and south portions of the site. Topography across that portion of the site to be developed slopes generally toward the south and west. Within the western portion of the site, a 2H:1V (Horizontal:Vertical) (approximate) slope descends in excess of 100 vertical feet toward the western property line; total slope height is undetermined as topography presented on the referenced DRS Plan stops approximately 100 feet short of the west property line and does not show a toe of slope. A 3H:1V (approximate) slope descends to the south approximately 10 vertical feet toward a westerly trending ravine within the southerly portion of the site. The February 25th, 2013 ESNW report indicates that a visual slope reconnaissance was conducted across portions of the steep slope areas of the site and that no signs of recent, large scale erosion or slope instability were observed and that "*stability of the slope areas of the property can be characterized as good.*"

It appears that ESNW did not have a detailed site plan showing current proposed development for preparation of the referenced February 25, 2013 report. The two subsequent reports referenced above describe currently proposed development and present stability sections that appear to be based on the referenced DRS Plan but do not list the specific reference.

Proposed development as shown on the referenced DRS Plan includes a 21-lot subdivision with an estimated earthwork volume of approximately 3,300 cubic yards cut and 10,000 cubic yards fill. Development is concentrated to the flatter portion of the site and will occupy approximately the northeastern two-thirds of the property. Smithers Avenue is to be extended south from 47th Avenue to the central portion of the site where the roadway will turn east and extend to the eastern property line as SE 186th Place. A storm water vault is to be located within the southwest portion of the development area. Lots 1 through 8 and the storm water vault are situated along the top of the westerly descending 2H:1V slope. A 4-foot-high rockery wall is proposed along the western edge of these lots and vault area. A 2H:1V fill slope will extend from the wall to the pad grade. Excluding the height of the wall, the fill slope achieves a maximum slope height of up to approximately 20 vertical feet. As planned, the structures on Lots 1 through 8 will extend anywhere from a few feet to approximately 40 feet onto the proposed fill slope. As proposed, the storm water vault will be discharged into the westerly trending ravine within the southern portion of the site.

Subsurface Conditions

The referenced reports generally summarize subsurface conditions at the site as glacial till. The February 25, 2013 report indicates that soil "*terraces were observed down the steep slope at the west side of the site which may correlate to the recessional stratified drift kame terrace deposits, however, the proposed development will not extend to those locations.*" Test pit logs presented with the February 25, 2013 report indicate medium dense to dense, moist to wet

sand to a depth of 8 feet in TP-1 within the northeast portion of the site; medium stiff to hard, moist to wet silt located along the top of the slope in TP-6 and TP-7, and between 2.5 and 8 feet below ground surface within TP-8 within the western portion of the site; and, medium dense to very dense, generally moist, silty sand with variable gravel below the sand in TP-1, below the silt in TP-8 and within TP-2 through TP-5 across the remainder of the site.

Review of the *Geologic Map of King County*, Booth, Troost, Wisher, May 2006, indicates that recessional outwash and/or pre-Fraser, coarse grained non-glacial soils on the westerly descending slope within the western portion of the site and glacial till within the central and eastern portion of the site. An earlier publication titled: *Geologic Map of the Renton Quadrangle, King County, Washington* by D.R. Mullineaux, U.S. Geological Survey, Geologic Quadrangle Map GQ-405, Publication Date: 1965, Map Scale: 1:24,000 indicates that the soils on the westerly descending slope within the western portion of the site consist of undifferentiated quaternary deposits of glaciofluvial sand and gravel, glaciolacustrine clay and sand, and non-glacial sand, clay and thin peat.

Ground water was reported at a depth of 6 feet within the sandy soil reported in TP-1; ground water was not reported within the other test pits excavated at the site.

Comments

Based on our review, we have the following comments:

1. Our general impression is that subsurface conditions within all but the northeast portion of the site were treated in the reports as a single homogeneous unit, when it appears based on information presented on the referenced geologic maps, that site geology is more complex. Given the importance of slope stability to the project and the potential for geologic aspects of subsurface stratigraphy to play a major role in slope stability, the geology cross section of the slope and associated engineering properties should be defined in greater detail. A supplemental report should be prepared and should contain a geologic map and geologic cross-section(s). The map and section(s) should show the test pit locations, location and extent of geologic strata encountered, existing and proposed grade, proposed retaining walls, proposed buildings and conceptual depths of foundations. There may not currently be enough existing subsurface information to determine the presence of potentially adversely oriented interbeds of silt or other plane of weakness that could affect slope stability; additional, deeper subsurface exploration borings may be necessary.

2. The *Renton Municipal Code* (RMC)4-3-050-B1c defines sensitive slopes as twenty five percent (25%) to forty percent (40%) and protected slopes, forty percent (40%) or greater. RMC 4-3-050-J1 defines "Geologic Hazards" and provides specific guidelines for activities on or within 50 feet of sites with geologic hazards. The following classifications for geologic hazards are taken directly from RMC 4-3-050-J1:

a. Steep Slopes:

i. Steep Slope Delineation Procedure: The boundaries of a regulated steep sensitive or protected slope are determined to be in the location identified on the City of Renton's Steep Slope Atlas. An applicant's qualified professional may substitute boundaries independently derived from survey data for the City's consideration in determining the boundaries of sensitive or protected steep slopes. All topographic maps shall utilize two foot (2') contour intervals or the standard utilized in the City of Renton Steep Slope Atlas.

ii. Steep Slope Types:
(a) Sensitive slopes.
(b) Protected slopes.

b. Landslide Hazards:

i. Low Landslide Hazard (LL): Areas with slopes less than fifteen percent (15%).

ii. Medium Landslide Hazard (LM): Areas with slopes between fifteen percent (15%) and forty percent (40%) and underlain by soils that consist largely of sand, gravel or glacial till.

iii. High Landslide Hazards (LH): Areas with slopes greater than forty percent (40%), and areas with slopes between fifteen percent (15%) and forty percent (40%) and underlain by soils consisting largely of silt and clay.

iv. Very High Landslide Hazards (LV): Areas of known mappable landslide deposits.

c. Erosion Hazards:

i. Low Erosion Hazard (EL): Areas with soils characterized by the Natural Resource Conservation Service (formerly U.S. Soil Conservation Service) as having slight or moderate erosion potential, and that slope less than fifteen percent (15%).

ii. High Erosion Hazard (EH): Areas with soils characterized by the Natural Resource Conservation Service (formerly U.S. Soil Conservation Service) as having severe or very severe erosion potential, and that slope more steeply than fifteen percent (15%).

As indicated earlier in this letter, current development plans include placement of a 4 foot wall on the face of the westerly descending slope within the western portion of

the site. The wall is to support the toe of a 2H:1V fill slope to create support pads for the proposed residences and vault along the top of the slope. The residential structures on these pads will extend into the sloping area.

3. Based on the classifications presented above, the slope on which the retaining wall/fill slope is to be founded is a regulated steep sensitive/protected slope (RMC 4-3-050-J1a) with high erosion hazard (RMC 4-3-050-J1b(iii)), and high landslide hazards (RMC 4-3-050-J1c(ii)). Based on these designations, development is prohibited per RMC 4-3-050-J5a. In order for development to be allowed, RMC 4-3-050-J2 requires that a study must demonstrate the following:

    - The proposal will not increase the threat of the geological hazard to adjacent or abutting properties beyond pre-development conditions; and (Ord. 5676, 12-3-2012)

    - The proposal will not adversely impact other critical areas; and

    - The development can be safely accommodated on the site.

    The three conditions listed above have not been satisfied by the referenced reports. The results of ~~the~~ stability analyses before and after development demonstrating how the three conditions as listed above are satisfied ~~as~~ are required. see correction email 11/18/13

4. Grading regulations outlined in RMC 4-4-060L require that a line be established from which setbacks for structures and slopes is to be measured and a minimum setback for each are presented. The report documents imply that the line from which setback is to be measured is at the top of the existing westerly steep slope. Plans indicate that residential footings will extend into the steeply sloping fill within the western portion of the site. Based on the steepness of the slope (50 percent) a setback between the lowest outside edge of footings to daylight in the adjacent slope face would be more appropriate.

5. RMC 4-4-060 N6 indicates that creation of a permanent fill slope in excess of 15 feet high at a 40 percent gradient would create a protected steep slope and would not be allowed unless conditions of RMC 4-3-050 N2a(ii) are satisfied. As presented, the stability analyses evaluate the potential for deep-seated instability of the slope under both existing and proposed conditions. The analyses should also consider the stability of the proposed fill slope/wall where slopes in excess of 15 feet are proposed (Lots 1, 7, and 8). The conditions of RMC 4-3-050.J.2 a (i, ii, iii) as indicated in Comment 2 must be met.

6. The following Table presents a summary of factors of safety presented for existing and proposed conditions anticipated at the site as presented in the April 10, 2013 and July 15, 2013 reports. During our review of the analyses, several issues were noted

which require re-evaluation of various conditions and presentation of revised factors of safety.

Factor of Safety	April 10, 2013		July 15, 2013			
			Residential Area		Vault Area	
	Existing	Proposed	Exist	Proposed	Existing	Proposed
Static	2.127[1,2]	1.919[2]	2.200[3]	2.091[2,5] (1.629)[4]	2.137[3]	2.040[3,5,6] (1.585)[4]
Seismic	1.323[1,2]	1.228[2]	1.382[2] (1.236)	1.366[2,5](1.095)[4]	1.399[2,5] (1.175)[4]	1.347[2,5,6] (1.090)[4]

1. Slice thickness is less than 1 foot between toe of slope and exit point. Exit point should be re-evaluated and modified.
2. Location of center/radius of failure circle shown on section does not agree with center/radius listed in calculation.
3. Missing results for slip circle center and slices – cannot evaluate results.
4. Value in parenthesis is presented on calculation sheets – does not agree with value indicated on section
5. Failure circle analyzed and results presented is inconsistent with results on section – entry/exit points for failure circle indicate a relatively small portion of the slope.
6. The vault should be modeled as a surcharge rather than a region with strength parameters.

Stability analyses conducted on the westerly descending slope should be re-evaluated based on understanding of subsurface conditions in the vicinity of the slope enhanced through Comment 1, above.

7. ESNW indicates that rockeries will be used to "face" fill slopes. Rockeries may be used to mitigate erosion of cut slopes where very dense native soil is exposed. Unreinforced rockeries are not engineered structures and where in excess of 4 feet high (including imbedment depth), should not be used in place of retaining walls.

8. As proposed storm water from the detention vault is to be directed toward the southerly ravine and ultimately toward the westerly descending slope, ESNW has identified the soils on the slope as "high erosion hazard" and should consider alternate recommendations to prevent water from being directed over site slopes. Alternatively, the applicant should demonstrate that flow from the outfall system will not cause erosive flows.

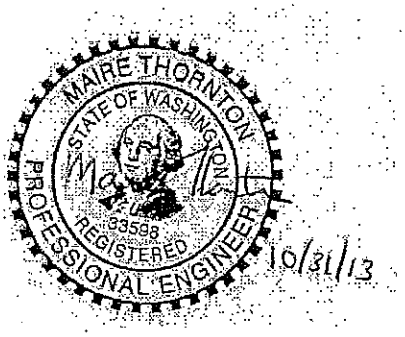
9. February 25, 2013 report indicates design in accordance with the 2006 *International Building Code* (IBC). The City of Renton has adopted the 2012 IBC. Seismic design of structures should be in conformance with the 2012 IBC including recommended seismic surcharge on walls.

Closure

This letter has been prepared for the exclusive use of our client and their agents, for specific application to this project. Within the limitations of scope, schedule, and budget, our services have been performed in accordance with generally accepted geotechnical engineering and engineering geology practices in effect in this area at the time our review was completed. No other warranty, expressed or implied, is made.

If you should have any questions, or if we can be of additional help to you, please do not hesitate to call.

Sincerely,
ASSOCIATED EARTH SCIENCES, INC.
Tacoma, Washington



Bruce L. Blyton, P.E.
Senior Principal Engineer

Maire Thornton, P.E.
Senior Engineer

MT/pc
TE130415A3
Projects\20130415\TE\WP

July 15, 2013
ES-2660.01

Earth Solutions NW LLC

- Geotechnical Engineering
- Construction Monitoring
- Environmental Sciences

Geonerco Properties WA, LLC
1441 North 34th Street, #200
Seattle, Washington 98103

Attention: Mr. Jamie Waltier

Subject: Slope Setback Response
Vuecrest Estates
Residential Plat
Renton, Washington

Reference: Earth Solutions NW, LLC
Geotechnical Engineering Study
ES-2660, dated February 2013

Dear Mr. Waltier:

As requested, Earth Solutions NW, LLC (ESNW) has prepared this letter to address the setback from the top of a slope. ESNW previously prepared the referenced geotechnical engineering study for the site.

Site Conditions

The City of Renton Municipal Code defines steep slopes as follows:

- Sensitive Slopes: Areas with slopes between 25 percent and 40 percent.
- Protected Slopes: Areas with slopes greater than 40 percent.

Based on our observations and review of the referenced topographic survey, sensitive slopes are present along the western and southern portions of the property, and protected slopes are present along the western portion of the property.

The referenced geotechnical engineering study identifies soil conditions onsite to consist of glacial till which is dense to very dense near the surface.

EXHIBIT 24

Proposed Development Adjacent to Slopes

We understand that the proposed development will incorporate a four foot maximum rockery as well as a stormwater vault structure near the top of a slope at the west side of the subject property. The rockery will be located adjacent to the top of the slope, and will be facing a 2:1 (horizontal:vertical) partial fill slope above. Single family residences will be located with a 20 foot setback from the top of the natural slope and the proposed stormwater vault is to be located with a 10 foot setback from the top of the natural slope near the southwest portion of the subject property.

Slope Fill Placement

Grading activities required to achieve the design alignment will include a four foot rockery facing a 2:1 partial fill slope. Portions of the 2:1 partial fill slope will be located within 20 feet of a sensitive slope area. Placement of fill on slopes is acceptable provided the existing slope is stripped and benched and a keyway is provided at the base. A typical slope fill placement detail is provided as an attachment.

Opinion and Recommendations

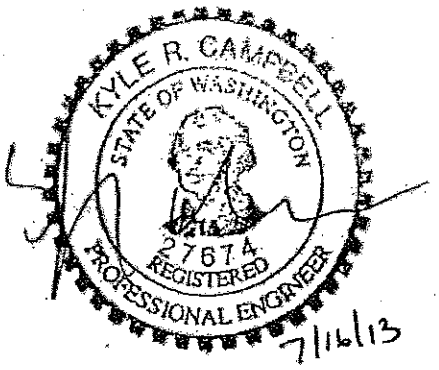
Section 4-3-050-J-2 of The City of Renton Municipal Code requires that development within 50 feet of a sensitive or protected slope must demonstrate "i. [t]he proposal will not increase the threat of the geologic hazard to adjacent or abutting properties beyond pre-development conditions; ii. [t]he proposal will not adversely impact other critical areas; and iii. [t]he development can be safely accommodated on the site". We performed a slope analysis of the proposed development, utilizing soil condition data, visual slope reconnaissance information, existing topography, and proposed topography and development. The results of the slope analysis are provided as an attachment.

Based on the results of our slope analysis, and our understanding of the proposed development, in our opinion, the proposed development is feasible from a geotechnical standpoint. In our opinion, the proposed development will not increase the threat of the geologic hazard to adjacent or abutting properties beyond pre-development conditions, will not adversely impact other critical areas, and can be safely accommodated on the site.

If you have any questions, or if additional information is required, please call.

Sincerely,

EARTH SOLUTIONS NW, LLC



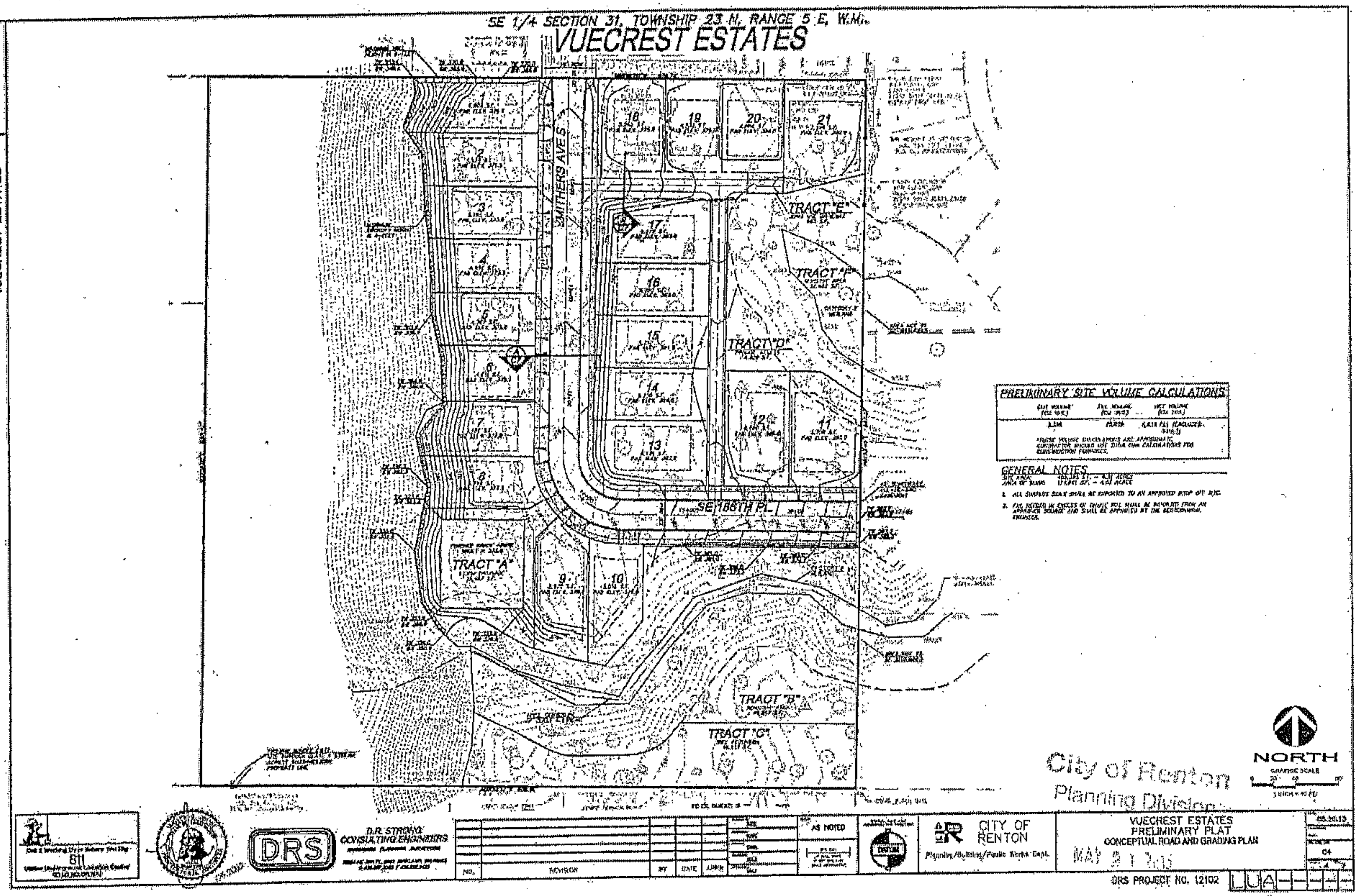
Henry T. Wright, E.I.T.
Staff Engineer

Kyle R. Campbell, P.E.
Principal

Attachments: Site Plan
Plate 1 – Slope Fill Placement
Slope Stability Analysis

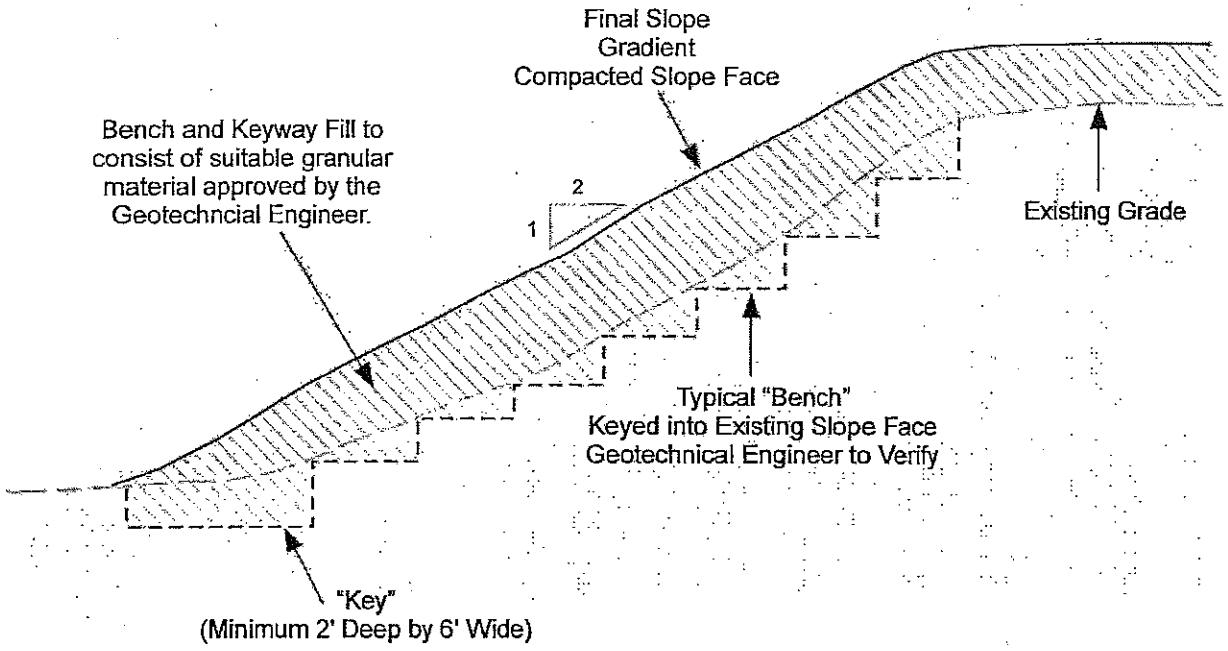
cc: DR Strong Consulting Engineers, Inc.
Attention: Mr. Maher Joudi (Email only)

City of Renton
Attention: Ms. Elizabeth Higgins (Email only)



VUECREST ESTATES

SCHEMATIC ONLY - NOT TO SCALE
NOT A CONSTRUCTION DRAWING



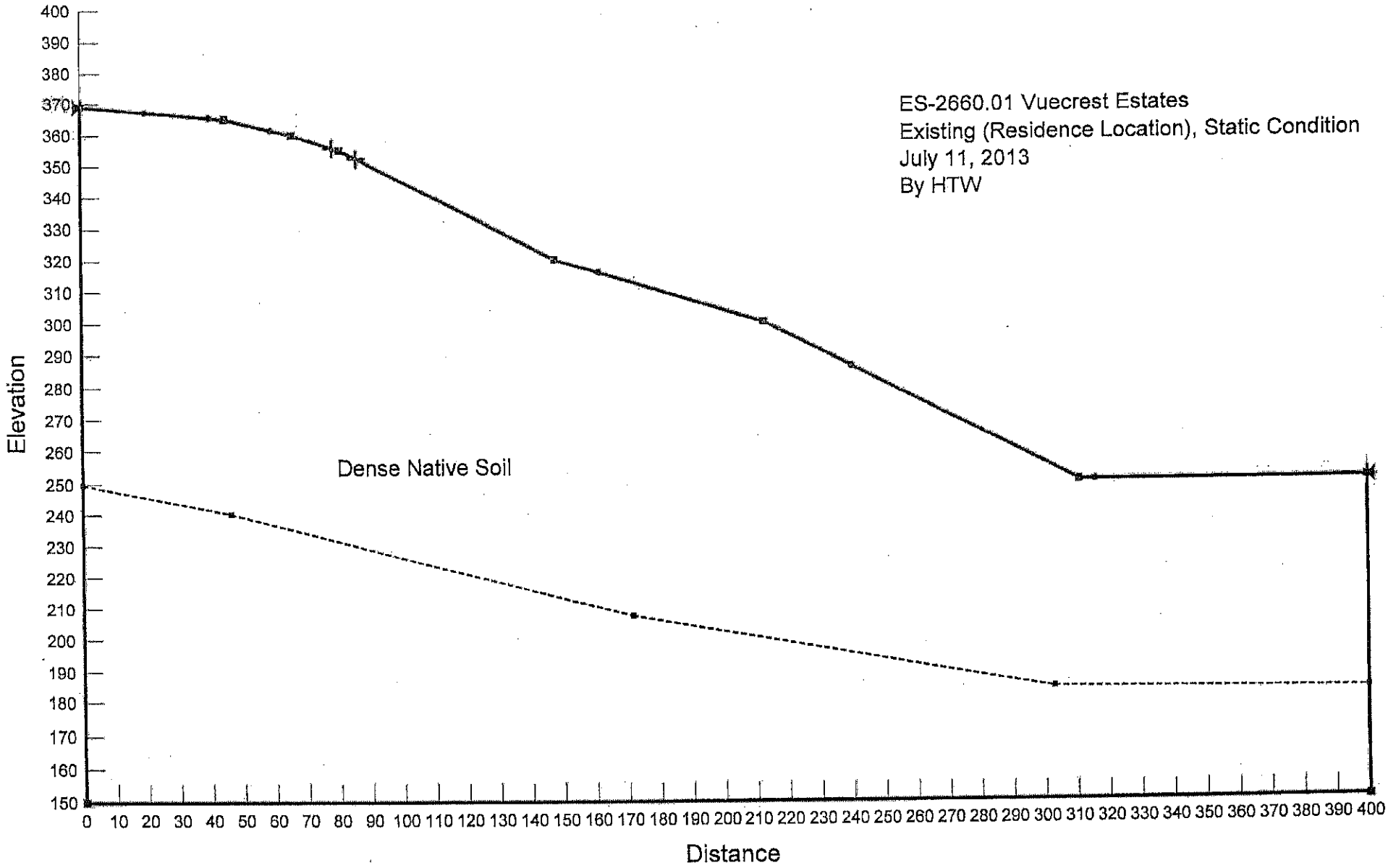
NOTES:

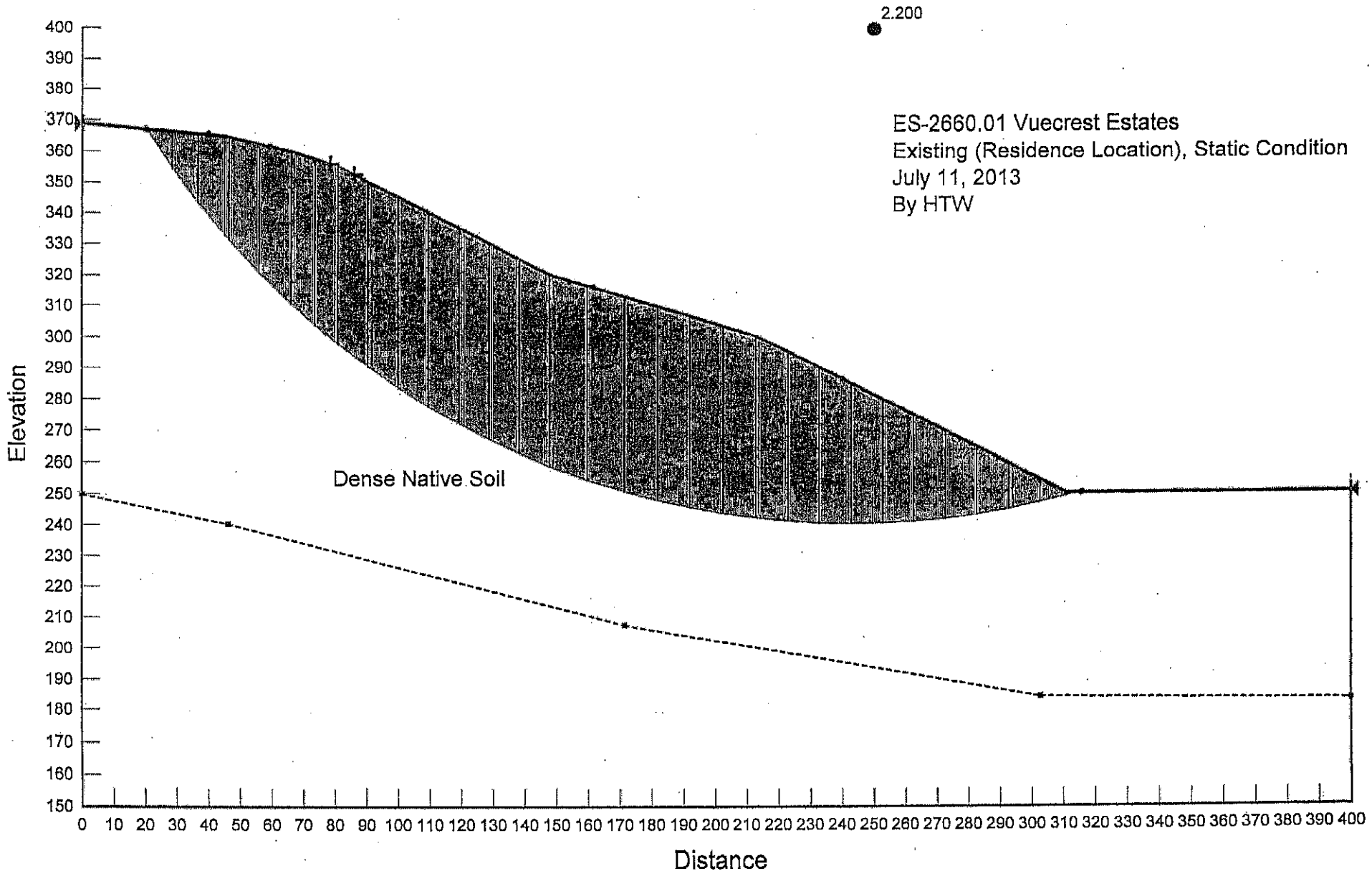
- Slope should be stripped of topsoil and unsuitable materials prior to excavating Key Way or benches.
- Benches will typically be equal to a dozer blade width, approximately 8 feet, but a minimum of 4 feet.
- Final slope gradient should be 2 : 1 (horizontal : vertical).
- Final slope face should be densified by over-building with compacted fill and trimming back to shape or by compaction with dozer or roller.
- Planting or hydroseeding slope face with a rapid growth deep rooted vegetative mat will reduce erosion potential of slope area.
- Use of pegged in place jute matting or geotechnical fabric will help maintain the seed and mulch in place until the root system has an opportunity to germinate.
- Structural fill should be placed in thin loose lifts not exceeding 12 inches in thickness. Each lift should be compacted to no less than the degree specified in the "Site Preparation and Earth Work" section of this report. No additional lift should be placed until compaction is achieved.

Earth Solutions NW LLC
Construction Monitoring
Environmental Sciences

SLOPE FILL DETAIL
Vuecrest Estates
Renton, Washington

Drwn. GLS	Date 07/11/2013	Proj. No. 2660.01
Checked HTW	Date July 2013	Plate 1


ES-2660.01 Vuecrest Estates
Existing (Residence Location), Static Condition
July 11, 2013
By HTW
Dense Native Soil
Elevation
Distance
400
390
380
370
360
350
340
330
320
310
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390 400


2.200
ES-2660.01 Vuecrest Estates
Existing (Residence Location), Static Condition
July 11, 2013
By HTW
Dense Native Soil
Elevation
Distance
400 390 380 370 360 350 340 330 320 310 300 290 280 270 260 250 240 230 220 210 200 190 180 170 160 150
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390 400

Slope Stability

File Information

Title: Vuecrest
Created By: Henry Wright
Revision Number: 14
Last Edited By: Henry Wright
Date: 7/11/2013
Time: 11:26:51 AM
File Name: Vuecrest Existing (Residence), Static Condition.gsz
Directory: C:\Users\henry.wright\Documents\SlopeW\Vuecrest Estates\

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

Slope Stability

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Apply Phreatic Correction: No
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: Piezometric Line
Use Staged Rapid Drawdown: No
Slip Surface
Direction of movement: Left to Right
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: No
Tension Crack
Tension Crack Option: (none)
FOS Distribution
FOS Calculation Option: Constant
Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Dense Native Soil

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 200 psf
Phi: 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (0.25417, 368.97741) ft
Left-Zone Right Coordinate: (78.40479, 355.86507) ft
Left-Zone Increment: 4
Right Projection: Range
Right-Zone Left Coordinate: (86.04495, 352.36458) ft
Right-Zone Right Coordinate: (400, 250) ft
Right-Zone Increment: 4
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (0, 369) ft
Right Coordinate: (400, 250) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
	0	249.88736

	46.27953	240.31824
	171.63495	207.50984
	302.86855	184.40726
	400	183.45035

Seismic Loads

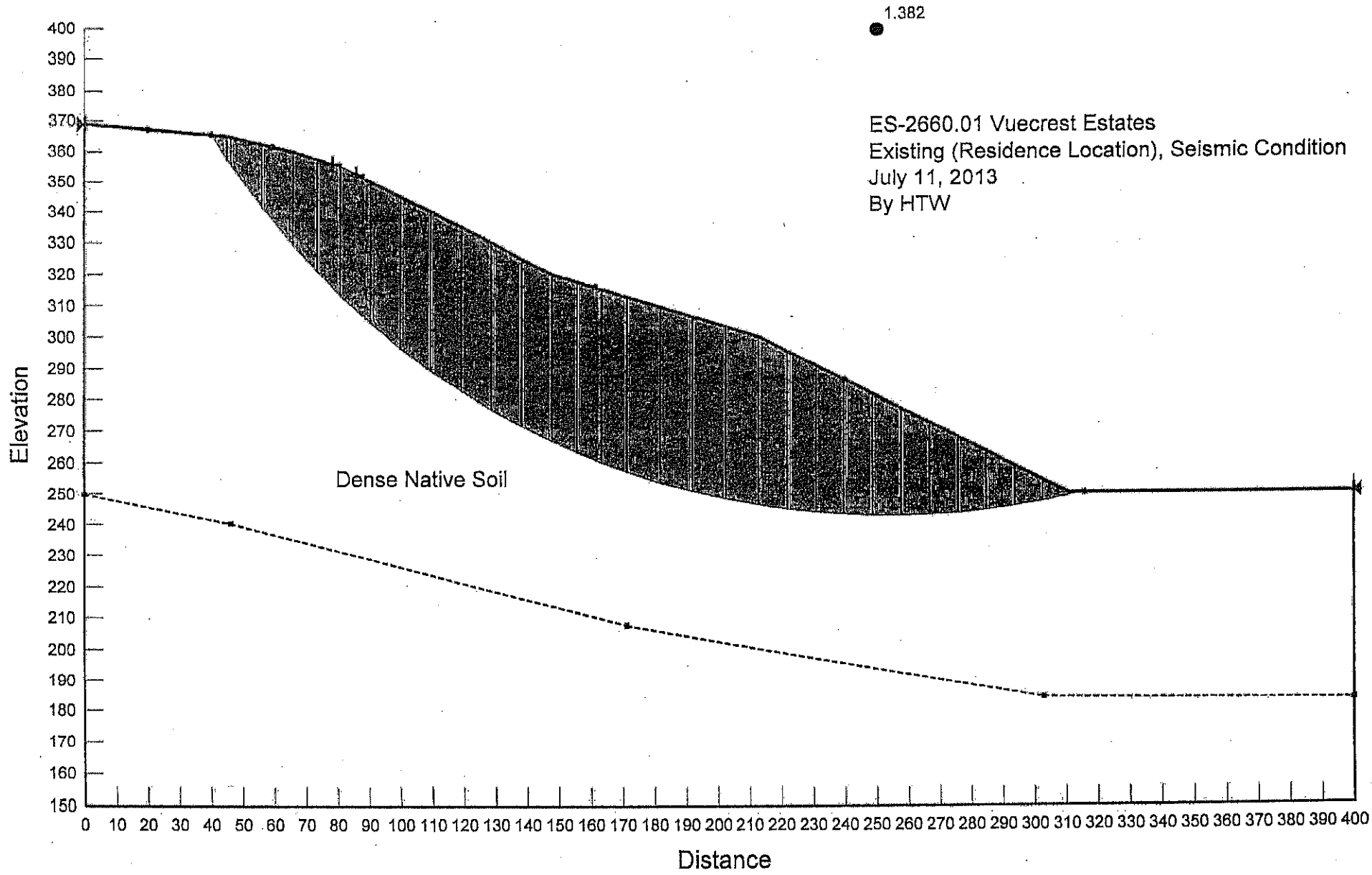
Horz Seismic Load: 0

Regions

	Material	Points	Area (ft^2)
Region 1	Dense Native Soil	3,4,5,6,7,8,9,10,1,2	61452.5

Points

	X (ft)	Y (ft)
Point 1	400	150
Point 2	0	150
Point 3	0	369
Point 4	45	365
Point 5	66	360
Point 6	81	355
Point 7	148	320
Point 8	213	300
Point 9	311	250
Point 10	400	250


1.382
ES-2660.01 Vuecrest Estates
Existing (Residence Location), Seismic Condition
July 11, 2013
By HTW
Dense Native Soil
Elevation
Distance
400 390 380 370 360 350 340 330 320 310 300 290 280 270 260 250 240 230 220 210 200 190 180 170 160 150
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390 400

Slope Stability

File Information

Title: Vuecrest
Created By: Henry Wright
Revision Number: 15
Last Edited By: Henry Wright
Date: 7/11/2013
Time: 12:09:46 PM
File Name: Vuecrest Existing (Residence), Seismic Condition.gsz
Directory: C:\Users\henry.wright\Documents\SlopeW\Vuecrest Estates\
Last Solved Date: 7/11/2013
Last Solved Time: 12:09:50 PM

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

Slope Stability

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Apply Phreatic Correction: No
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: Piezometric Line
Use Staged Rapid Drawdown: No
Slip Surface
Direction of movement: Left to Right
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: No
Tension Crack
Tension Crack Option: (none)
FOS Distribution

FOS Calculation Option: Constant

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Dense Native Soil

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 200 psf
Phi: 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (0.25417, 368.97741) ft
Left-Zone Right Coordinate: (78.40479, 355.86507) ft
Left-Zone Increment: 4
Right Projection: Range
Right-Zone Left Coordinate: (86.04495, 352.36458) ft
Right-Zone Right Coordinate: (400, 250) ft
Right-Zone Increment: 4
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (0, 369) ft
Right Coordinate: (400, 250) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
	0	249.88736
	46.27953	240.31824
	171.63495	207.50984
	302.86855	184.40726
	400	183.45035

Seismic Loads

Horz Seismic Load: 0.2
Ignore seismic load in strength: No

Regions

	Material	Points	Area (ft^2)
Region 1	Dense Native Soil	3,4,5,6,7,8,9,10,1,2	61452.5

Points

	X (ft)	Y (ft)
Point 1	400	150
Point 2	0	150
Point 3	0	369
Point 4	45	365
Point 5	66	360
Point 6	81	355
Point 7	148	320
Point 8	213	300
Point 9	311	250
Point 10	400	250

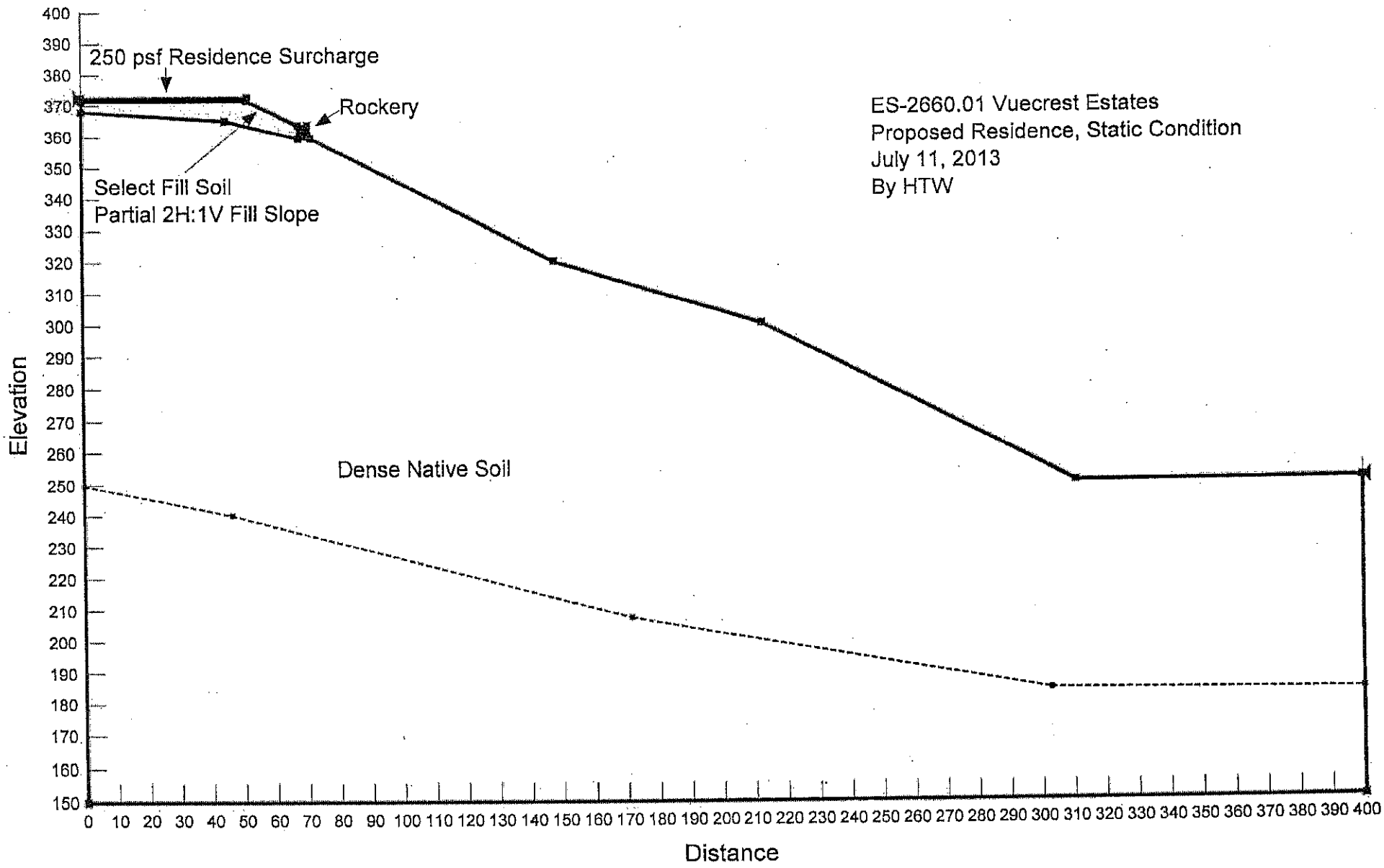
Critical Slip Surfaces

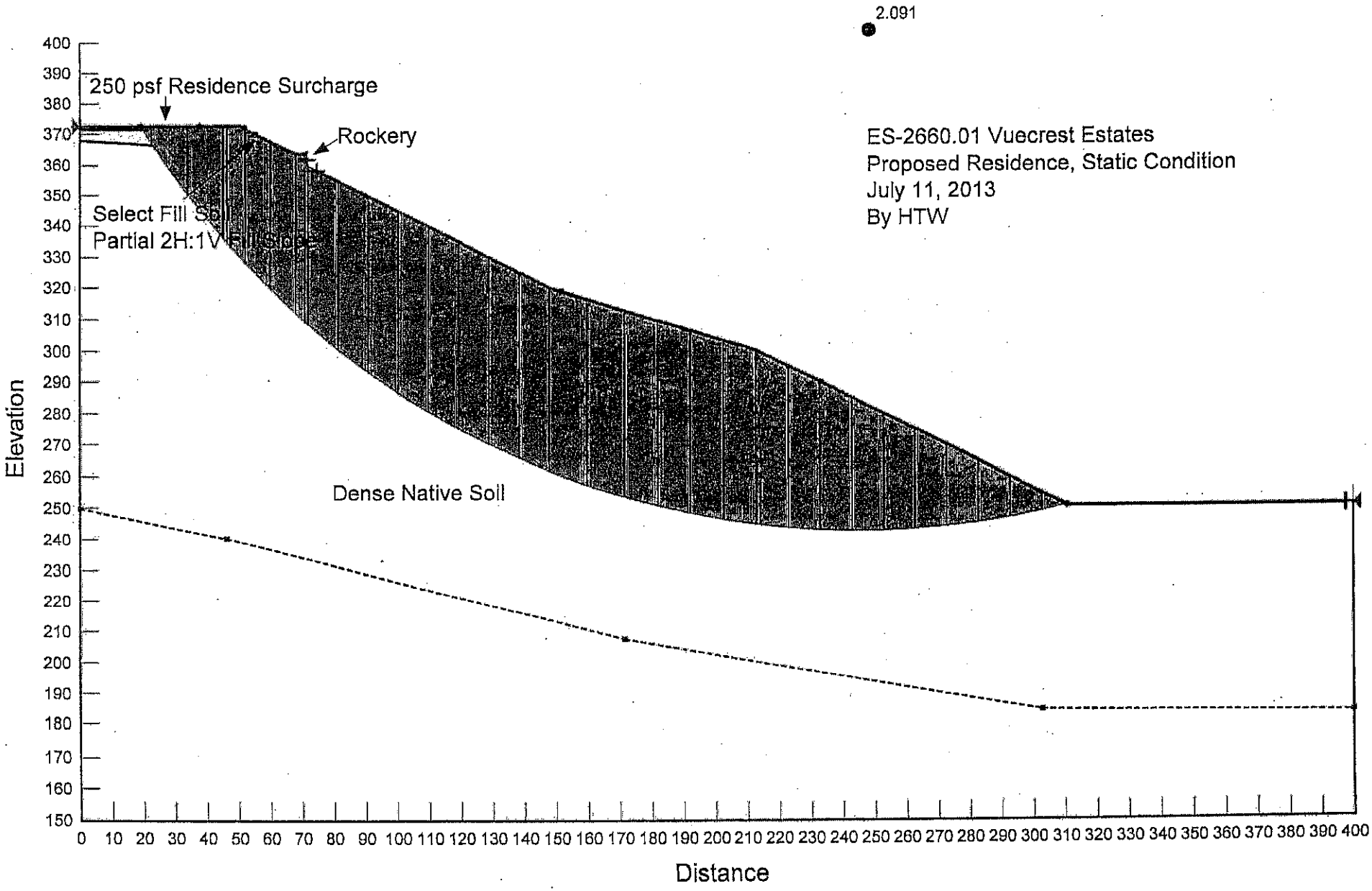
	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	72	1.236	(358.026, 738.41)	490.211	(39.8904, 365.454)	(309.884, 250.569)

Slices of Slip Surface: 72

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	72	42.445215	363.3048	-7624.8948	73.470895	51.444875	200
2	72	45.639765	360.6264	-7499.202	270.58802	189.46777	200
3	72	51.209645	356.1404	-7307.8444	532.71272	373.00946	200
4	72	61.06988	348.4293	-6987.6483	963.97772	674.98446	200
5	72	69.75	341.9485	-6725.0702	1278.8655	895.47124	200
6	72	77.25	336.6014	-6513.8947	1494.917	1046.7521	200

7	72	85.785715	330.78475	-6290.2863	1649.3756	1154.9052	200
8	72	95.357165	324.5511	-6057.6176	1744.5466	1221.5447	200
9	72	104.9286	318.62825	-5844.3848	1828.2044	1280.1225	200
10	72	114.5	313.0032	-5649.6729	1903.021	1332.5097	200
11	72	124.0714	307.6643	-5472.8657	1970.7862	1379.9593	200
12	72	133.64285	302.601	-5313.2347	2032.1265	1422.9103	200
13	72	143.2143	297.8038	-5170.181	2086.6104	1461.0604	200
14	72	151.93915	293.64535	-5053.222	2205.235	1544.1221	200
15	72	159.81745	290.0786	-4959.3088	2391.7152	1674.697	200
16	72	167.6958	286.6774	-4875.7459	2575.8415	1803.6236	200
17	72	175.7715	283.36095	-4778.5599	2760.245	1932.7444	200
18	72	184.0445	280.1338	-4668.0248	2941.9811	2059.9974	200
19	72	192.3175	277.0776	-4568.2167	3112.2163	2179.1973	200
20	72	200.5905	274.18895	-4478.7985	3266.0911	2286.9416	200
21	72	208.8635	271.4647	-4399.724	3398.2113	2379.4532	200
22	72	217.49345	268.79865	-4328.1769	3406.703	2385.3991	200
23	72	226.4803	266.20225	-4264.8501	3275.7891	2293.7322	200
24	72	235.46715	263.7902	-4213.0472	3093.2024	2165.8836	200
25	72	244.454	261.5597	-4172.6603	2857.4735	2000.8245	200
26	72	253.44085	259.5082	-4143.3209	2570.2657	1799.7194	200
27	72	262.4277	257.6334	-4125.0523	2235.5629	1565.358	200
28	72	271.41455	255.93325	-4117.7332	1859.8087	1302.2521	200
29	72	280.4014	254.40595	-4121.0983	1451.0476	1016.0345	200
30	72	289.38825	253.04985	-4135.178	1018.0391	712.83867	200
31	72	298.37515	251.86355	-4159.8636	569.25321	398.59539	200
32	72	306.37635	250.941	-4153.8817	163.22112	114.28866	200


250 psf Residence Surcharge
Rockery
Select Fill Soil
Partial 2H:1V Fill Slope
Dense Native Soil
ES-2660.01 Vuecrest Estates
Proposed Residence, Static Condition
July 11, 2013
By HTW
Elevation
Distance
400
390
380
370
360
350
340
330
320
310
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390 400


2.091
250 psf Residence Surcharge
Rockery
Select Fill Soil
Partial 2H:1V Fill Slope
Dense Native Soil
ES-2660.01 Vuecrest Estates
Proposed Residence, Static Condition
July 11, 2013
By HTW
Elevation
Distance
400 390 380 370 360 350 340 330 320 310 300 290 280 270 260 250 240 230 220 210 200 190 180 170 160 150
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390 400

Slope Stability

File Information

Title: Vuecrest
Created By: Henry Wright
Revision Number: 19
Last Edited By: Henry Wright
Date: 7/11/2013
Time: 1:05:41 PM
File Name: Vuecrest Proposed (Residence), Static Condition.gsz
Directory: C:\Users\henry.wright\Documents\SlopeW\Vuecrest Estates\
Last Solved Date: 7/11/2013
Last Solved Time: 1:05:43 PM

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

Slope Stability

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Apply Phreatic Correction: No
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: Piezometric Line
Use Staged Rapid Drawdown: No
Slip Surface
Direction of movement: Left to Right
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: No
Tension Crack
Tension Crack Option: (none)
FOS Distribution

FOS Calculation Option: Constant

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Dense Native Soil

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 200 psf
Phi: 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Select Fill Soil

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion: 0 psf
Phi: 32 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Rockery

Model: Mohr-Coulomb
Unit Weight: 140 pcf
Cohesion: 0 psf
Phi: 40 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Residence Surcharge

Model: Mohr-Coulomb
Unit Weight: 250 pcf
Cohesion: 0 psf
Phi: 40 °
Phi-B: 0 °
Pore Water Pressure

Piezometric Line: 1

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (0, 372.5) ft
Left-Zone Right Coordinate: (71.44582, 361.71672) ft
Left-Zone Increment: 4
Right Projection: Range
Right-Zone Left Coordinate: (74.48028, 358.21091) ft
Right-Zone Right Coordinate: (397.54265, 250) ft
Right-Zone Increment: 4
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (0, 372.5) ft
Right Coordinate: (400, 250) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
	0	249.88736
	46.27953	240.31824
	171.63495	207.50984
	302.86855	184.40726
	400	183.45035

Seismic Loads

Horz Seismic Load: 0

Regions

	Material	Points	Area (ft^2)
Region 1	Select Fill Soil	14,3,4,10,11,13	373.75
Region 2	Rockery	12,5,10,11	14
Region 3	Dense Native Soil	6,7,8,9,1,2,3,4,10,5	61433.25
Region 4	Residence Surcharge	16,13,14,15	52

Points

	X (ft)	Y (ft)
Point 1	400	150
Point 2	0	150
Point 3	0	368
Point 4	45	365
Point 5	72	359.5
Point 6	148	320
Point 7	213	300
Point 8	311	250
Point 9	400	250
Point 10	68	359.5
Point 11	68	363.5
Point 12	71	363.5
Point 13	52	371.5
Point 14	0	371.5
Point 15	0	372.5
Point 16	52	372.5

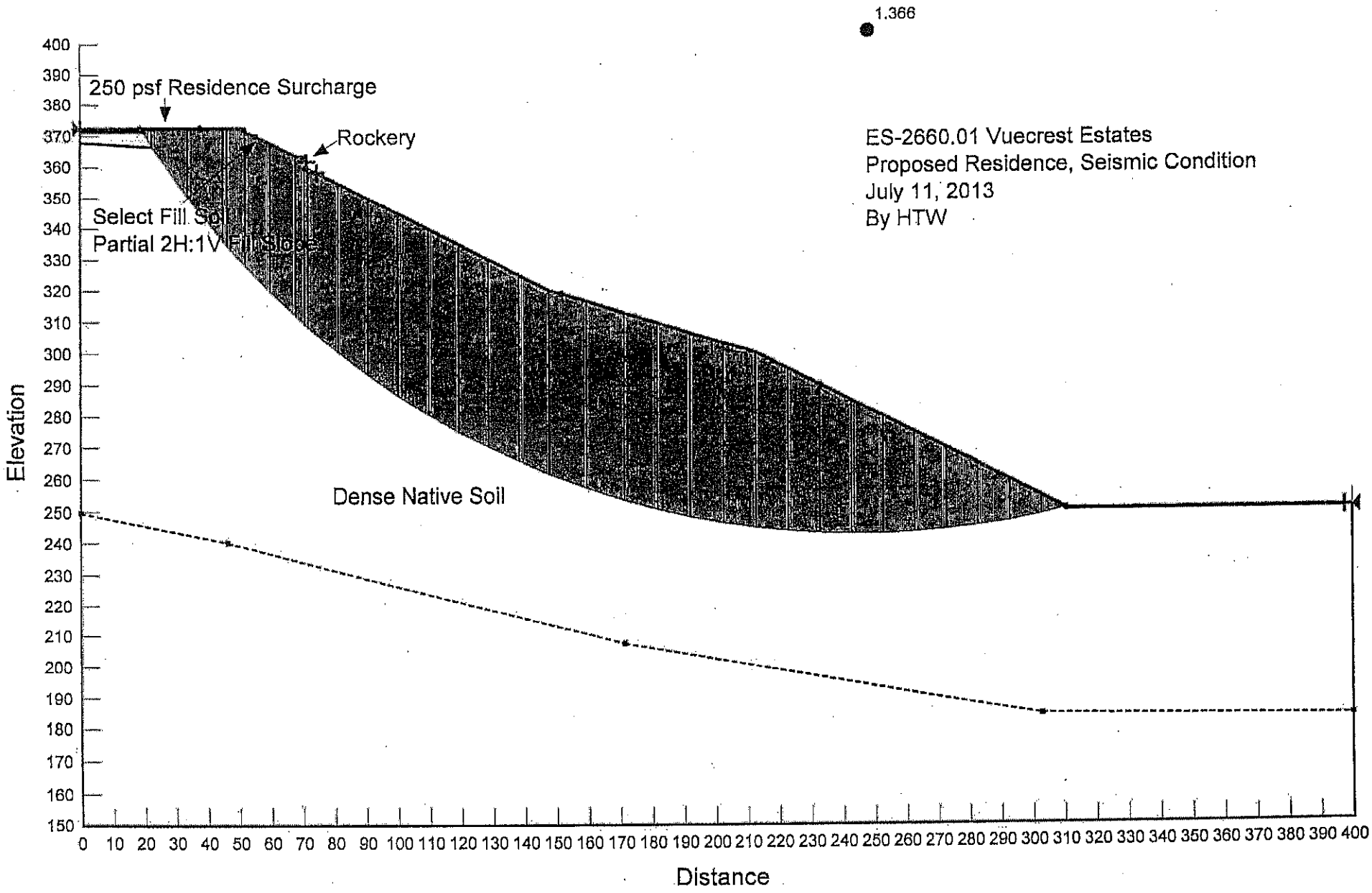
Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	77	1.629	(83.219, 394.107)	36.944	(55.3944, 369.803)	(74.4803, 358.211)

Slices of Slip Surface: 77

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	77	55.70952	369.4512	-8211.8676	17.083878	10.675192	0
2	77	56.3398	368.76535	-8179.3793	48.523808	30.32104	0
3	77	56.97008	368.11285	-8149.024	75.729556	47.321078	0
4	77	57.60036	367.4913	-8120.4885	99.65228	62.269655	0
5	77	58.23064	366.89855	-8093.7781	121.05085	75.640964	0
6	77	58.86092	366.33275	-8068.8239	140.53016	87.812988	0
7	77	59.491205	365.7923	-8045.3514	158.59894	99.103617	0
8	77	60.12149	365.27575	-8023.4573	175.64508	109.75523	0
9	77	60.75177	364.78185	-8002.8282	191.9913	119.96948	0
10	77	61.38205	364.30945	-7983.6623	207.88108	129.89851	0
11	77	62.01233	363.85755	-7965.8408	223.51799	139.66954	0
12	77	62.64261	363.42525	-7949.0785	238.99285	149.33931	0
13	77	63.27289	363.01175	-7933.5985	254.36607	158.94556	0
14	77	63.90317	362.6163	-7919.2535	269.65089	168.49657	0
15	77	64.53345	362.23825	-7905.9222	284.78182	177.95143	0
16	77	65.163735	361.87695	-7893.6703	299.65135	187.24294	0
17	77	65.79402	361.53185	-7882.4925	314.06576	196.25007	0
18	77	66.4243	361.20245	-7872.1786	327.81196	204.83964	0
19	77	67.05458	360.88825	-7862.8822	340.58603	212.82177	0

20	77	67.68486	360.58885	-7854.4259	352.0478	219.98388	0
21	77	68.2858	360.3165	-7847.2889	407.37415	341.8275	0
22	77	68.8574	360.0696	-7841.2744	446.89155	374.98654	0
23	77	69.429	359.834	-7835.8145	484.27895	406.35829	0
24	77	70.0006	359.6095	-7831.1033	518.98049	435.47634	0
25	77	70.6432	359.37085	-7826.7317	551.35905	386.06576	200
26	77	71.25	359.15605	-7823.2053	446.77	312.83172	200
27	77	71.75	358.98875	-7821.0954	208.16076	145.75573	200
28	77	72.310035	358.8113	-7819.1435	74.693799	52.301161	200
29	77	72.930105	358.6256	-7817.6889	47.940499	33.568299	200
30	77	73.550175	358.45165	-7816.9494	18.99098	13.297627	200
31	77	74.170245	358.28925	-7816.9001	-11.526695	-8.0710786	200


1.366
250 psf Residence Surcharge
Rockery
ES-2660.01 Vuecrest Estates
Proposed Residence, Seismic Condition
July 11, 2013
By HTW
Select Fill Soil
Partial 2H:1V Fill Slope
Dense Native Soil
Elevation
Distance
400 390 380 370 360 350 340 330 320 310 300 290 280 270 260 250 240 230 220 210 200 190 180 170 160 150
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390 400

Slope Stability

File Information

Title: Vuecrest
Created By: Henry Wright
Revision Number: 20
Last Edited By: Henry Wright
Date: 7/11/2013
Time: 1:09:16 PM
File Name: Vuecrest Proposed (Residence), Seismic Condition.gsz
Directory: C:\Users\henry.wright\Documents\SlopeW\Vuecrest Estates\
Last Solved Date: 7/11/2013
Last Solved Time: 1:09:20 PM

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

Slope Stability

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Apply Phreatic Correction: No
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: Piezometric Line
Use Staged Rapid Drawdown: No
Slip Surface
Direction of movement: Left to Right
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: No
Tension Crack
Tension Crack Option: (none)
FOS Distribution

FOS Calculation Option: Constant

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Dense Native Soil

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 200 psf
Phi: 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Select Fill Soil

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion: 0 psf
Phi: 32 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Rockery

Model: Mohr-Coulomb
Unit Weight: 140 pcf
Cohesion: 0 psf
Phi: 40 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Residence Surcharge

Model: Mohr-Coulomb
Unit Weight: 250 pcf
Cohesion: 0 psf
Phi: 40 °
Phi-B: 0 °
Pore Water Pressure

Piezometric Line: 1

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (0, 372.5) ft
Left-Zone Right Coordinate: (71.44582, 361.71672) ft
Left-Zone Increment: 4
Right Projection: Range
Right-Zone Left Coordinate: (74.48028, 358.21091) ft
Right-Zone Right Coordinate: (397.54265, 250) ft
Right-Zone Increment: 4
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (0, 372.5) ft
Right Coordinate: (400, 250) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
	0	249.88736
	46.27953	240.31824
	171.63495	207.50984
	302.86855	184.40726
	400	183.45035

Seismic Loads

Horz Seismic Load: 0.2
Ignore seismic load in strength: No

Regions

	Material	Points	Area (ft^2)
Region 1	Select Fill Soil	14,3,4,10,11,13	373.75
Region 2	Rockery	12,5,10,11	14
Region 3	Dense Native Soil	6,7,8,9,1,2,3,4,10,5	61433.25
Region 4	Residence Surcharge	16,13,14,15	52

Points

	X (ft)	Y (ft)
Point 1	400	150
Point 2	0	150
Point 3	0	368
Point 4	45	365
Point 5	72	359.5
Point 6	148	320
Point 7	213	300
Point 8	311	250
Point 9	400	250
Point 10	68	359.5
Point 11	68	363.5
Point 12	71	363.5
Point 13	52	371.5
Point 14	0	371.5
Point 15	0	372.5
Point 16	52	372.5

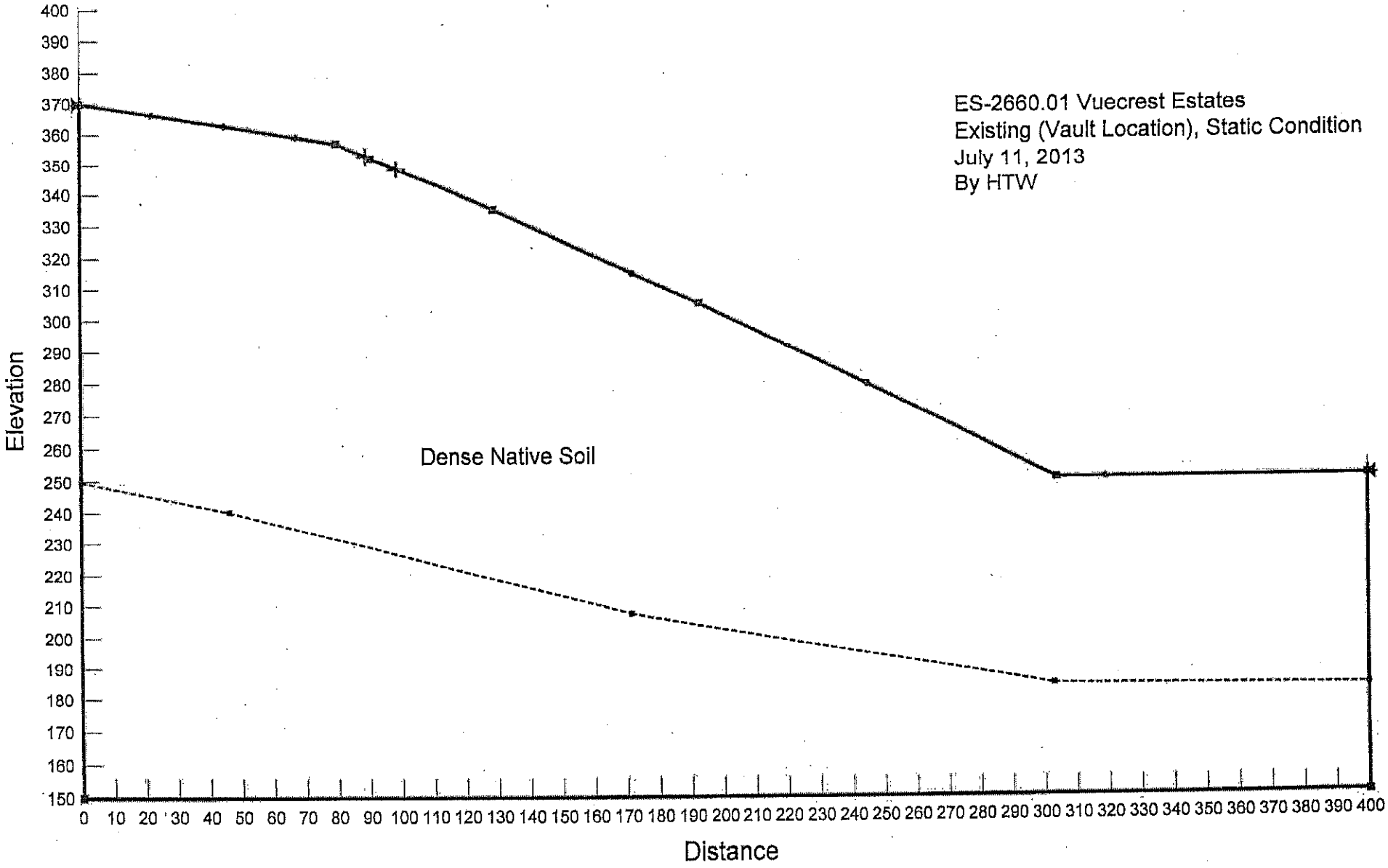
Critical Slip Surfaces

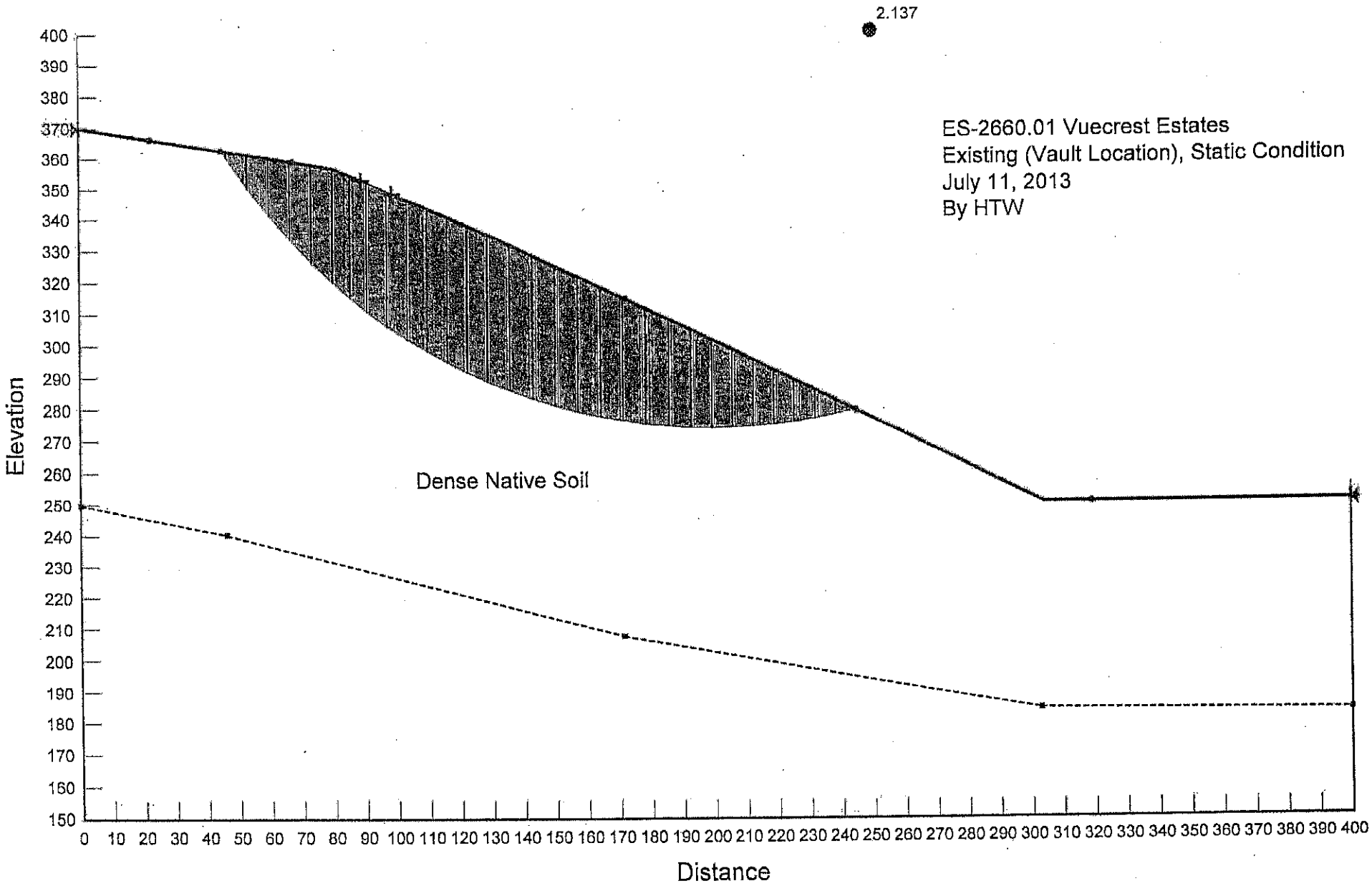
	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	51	1.095	(160.623, 633.019)	287.993	(37.8633, 372.5)	(74.4803, 358.211)

Slices of Slip Surface: 51

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	51	38.399605	372.24865	-8130.7732	46.254716	38.812315	0
2	51	39.47211	371.74865	-8113.46	138.78409	116.45368	0
3	51	40.635475	371.2126	-8095.3437	226.12457	141.29831	0
4	51	41.88971	370.6414	-8075.2303	283.97324	177.44618	0
5	51	43.143945	370.0774	-8056.1917	341.14518	213.17117	0
6	51	44.39818	369.5206	-8038.2369	397.77564	248.55781	0
7	51	45.652415	368.97095	-8019.9186	453.97959	283.67793	0
8	51	46.851575	368.4519	-8004.8563	507.45387	317.09237	0
9	51	47.99567	367.96285	-7993.0271	558.2996	348.86431	0
10	51	49.139765	367.4796	-7981.5672	609.08228	380.59685	0
11	51	50.28386	367.00215	-7970.4862	659.86225	412.3277	0
12	51	51.427955	366.5305	-7959.7061	710.70797	444.09963	0
13	51	52.615385	366.04715	-7949.2286	531.65833	332.21699	0
14	51	53.846155	365.5525	-7938.3046	521.75488	326.02863	0
15	51	55.076925	365.0644	-7927.8443	511.43554	319.58039	0
16	51	56.307695	364.58285	-7917.8513	500.63085	312.82888	0
17	51	57.538465	364.1078	-7908.3469	489.26448	305.72638	0

18	51	58.769235	363.63925	-7899.3288	477.27328	298.23345	0
19	51	60	363.1771	-7890.8002	464.56372	290.29163	0
20	51	61.230765	362.72135	-7882.0138	451.0577	281.85213	0
21	51	62.461535	362.27195	-7874.4969	436.69123	272.87497	0
22	51	63.692305	361.82885	-7866.7262	421.39242	263.31521	0
23	51	64.923075	361.3921	-7859.4676	405.10436	253.1373	0
24	51	66.153845	360.9616	-7852.7361	387.77825	242.31075	0
25	51	67.384615	360.53735	-7846.5348	369.37983	230.81414	0
26	51	68.617705	360.11855	-7840.5745	396.65391	332.83215	0
27	51	69.853115	359.70515	-7834.7836	442.46285	371.27042	0
28	51	70.73541	359.4131	-7831.0086	447.03481	313.01715	200
29	51	71.5	359.16345	-7827.8127	236.39673	165.52677	200
30	51	72.62007	358.8017	-7823.7949	1.6322479	1.1429123	200
31	51	73.86021	358.4068	-7818.9155	-31.133416	-21.799853	200


ES-2660.01 Vuecrest Estates
Existing (Vault Location), Static Condition
July 11, 2013
By HTW
Dense Native Soil
Elevation
Distance
400
390
380
370
360
350
340
330
320
310
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390 400


2.137
ES-2660.01 Vuecrest Estates
Existing (Vault Location), Static Condition
July 11, 2013
By HTW
Dense Native Soil
Elevation
Distance
400
390
380
370
360
350
340
330
320
310
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390 400

Slope Stability

File Information

Title: Vuecrest
Created By: Henry Wright
Revision Number: 10
Last Edited By: Henry Wright
Date: 7/11/2013
Time: 10:37:19 AM
File Name: Vuecrest Existing, Static Condition.gsz
Directory: C:\Users\henry.wright\Documents\SlopeW\Vuecrest Estates\

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

Slope Stability

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Apply Phreatic Correction: No
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: Piezometric Line
Use Staged Rapid Drawdown: No
Slip Surface
Direction of movement: Left to Right
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: No
Tension Crack
Tension Crack Option: (none)
FOS Distribution
FOS Calculation Option: Constant
Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Dense Native Soil

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 200 psf
Phi: 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (0, 370) ft
Left-Zone Right Coordinate: (89.06268, 352.8806) ft
Left-Zone Increment: 4
Right Projection: Range
Right-Zone Left Coordinate: (98.74228, 348.53635) ft
Right-Zone Right Coordinate: (400, 250) ft
Right-Zone Increment: 4
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (0, 370) ft
Right Coordinate: (400, 250) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
	0	249.88736

	46.27953	240.31824
	171.63495	207.50984
	302.86855	184.40726
	400	183.45035

Seismic Loads

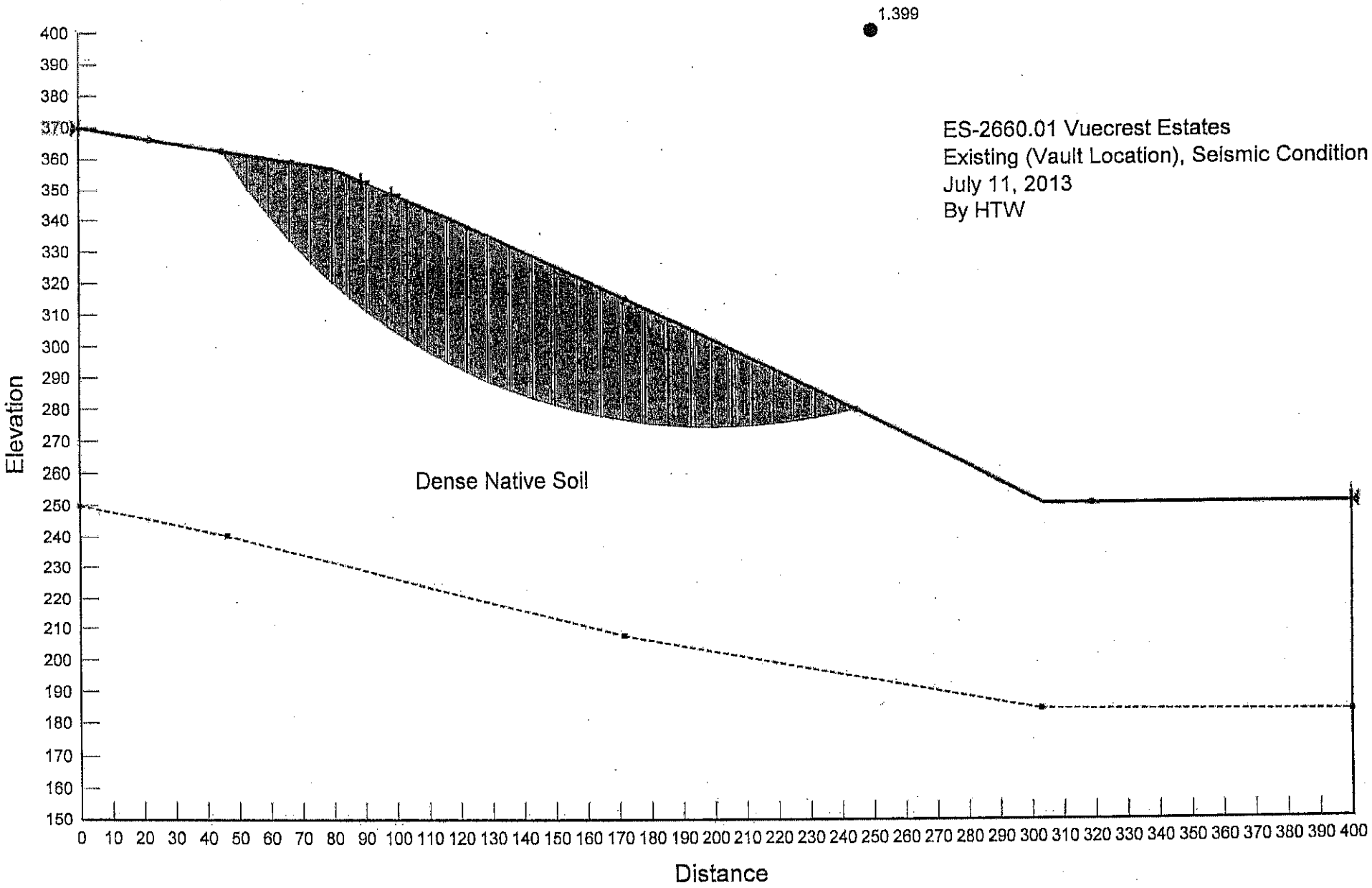
Horz Seismic Load: 0

Regions

	Material	Points	Area (ft^2)
Region 1	Dense Native Soil	9,4,5,6,7,8,1,2,3	61315

Points

	X (ft)	Y (ft)
Point 1	400	250
Point 2	400	150
Point 3	0	150
Point 4	80	357
Point 5	91	352
Point 6	129	335
Point 7	193	305
Point 8	304	250
Point 9	0	370


1.399
ES-2660.01 Vuecrest Estates
Existing (Vault Location), Seismic Condition
July 11, 2013
By HTW
Dense Native Soil
Elevation
Distance
400
390
380
370
360
350
340
330
320
310
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390 400

Slope Stability

File Information

Title: Vuecrest
Created By: Henry Wright
Revision Number: 12
Last Edited By: Henry Wright
Date: 7/11/2013
Time: 10:40:57 AM
File Name: Vuecrest Existing, Seismic Condition.gsz
Directory: C:\Users\henry.wright\Documents\SlopeW\Vuecrest Estates\
Last Solved Date: 7/11/2013
Last Solved Time: 10:41:00 AM

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

Slope Stability

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Apply Phreatic Correction: No
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: Piezometric Line
Use Staged Rapid Drawdown: No
Slip Surface
Direction of movement: Left to Right
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: No
Tension Crack
Tension Crack Option: (none)
FOS Distribution

FOS Calculation Option: Constant

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Dense Native Soil

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 200 psf
Phi: 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (0, 370) ft
Left-Zone Right Coordinate: (89.06268, 352.8806) ft
Left-Zone Increment: 4
Right Projection: Range
Right-Zone Left Coordinate: (98.74228, 348.53635) ft
Right-Zone Right Coordinate: (400, 250) ft
Right-Zone Increment: 4
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (0, 370) ft
Right Coordinate: (400, 250) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
	0	249.88736
	46.27953	240.31824
	171.63495	207.50984
	302.86855	184.40726
	400	183.45035

Seismic Loads

Horz Seismic Load: 0.2
Ignore seismic load in strength: No

Regions

	Material	Points	Area (ft^2)
Region 1	Dense Native Soil	9,4,5,6,7,8,1,2,3	61315

Points

	X (ft)	Y (ft)
Point 1	400	250
Point 2	400	150
Point 3	0	150
Point 4	80	357
Point 5	91	352
Point 6	129	335
Point 7	193	305
Point 8	304	250
Point 9	0	370

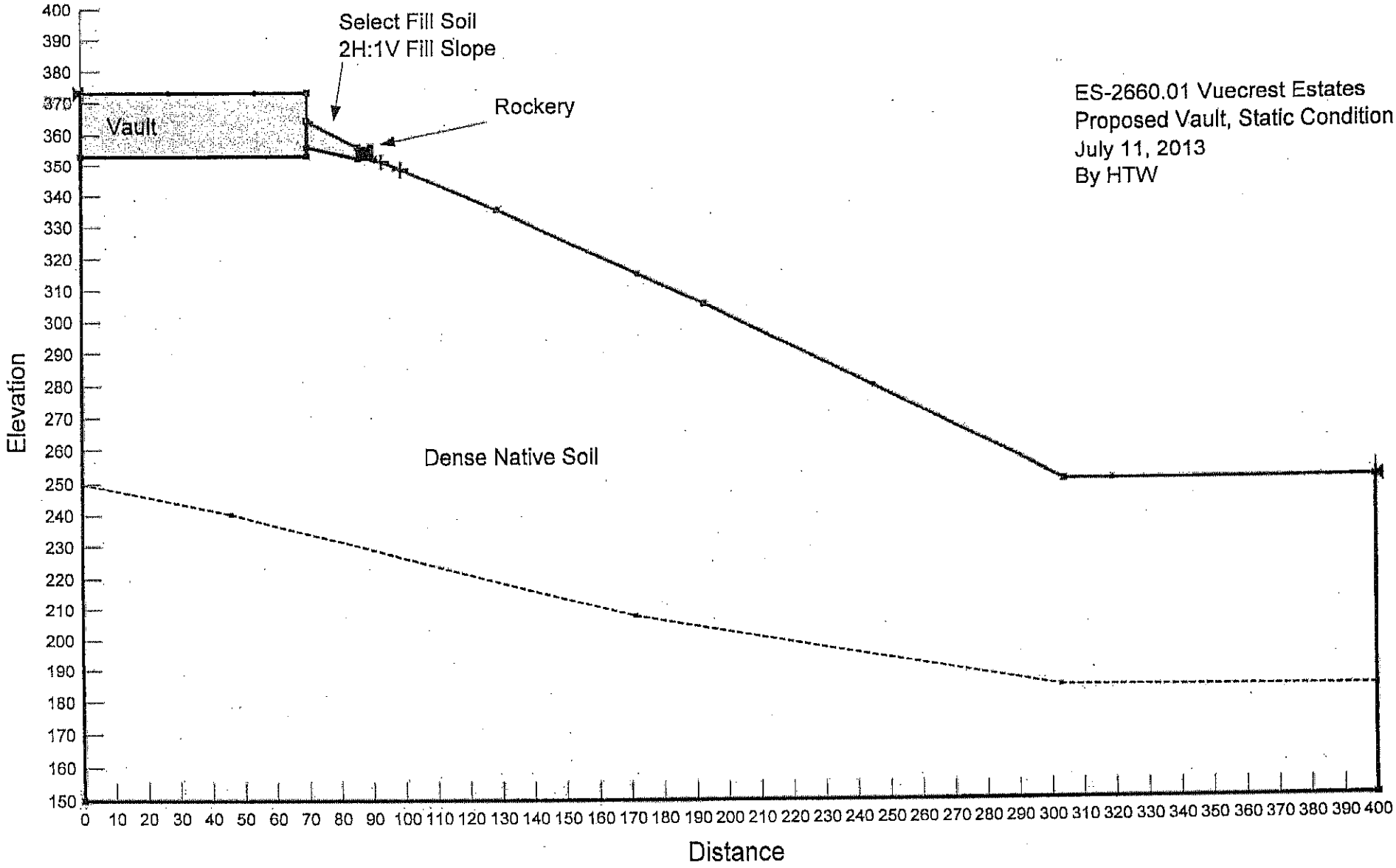
Critical Slip Surfaces

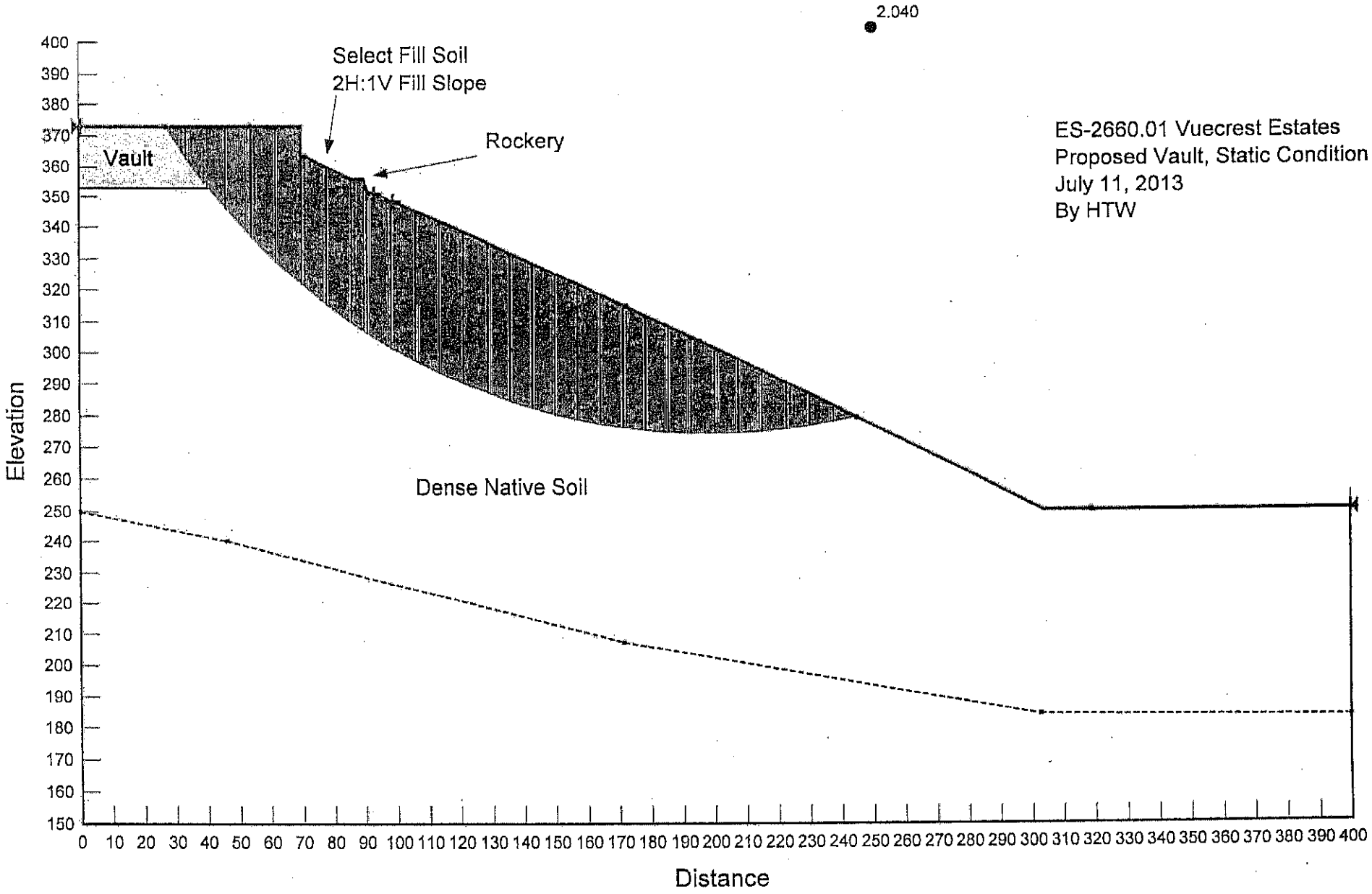
	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	92	1.175	(339.295, 641.678)	392.199	(67.3696, 359.052)	(301.337, 251.319)

Slices of Slip Surface: 92

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	92	70.527175	356.0809	-7619.5344	97.54932	68.304769	200
2	92	76.84239	350.26555	-7359.9058	478.95689	335.36922	200
3	92	85.5	342.7521	-7032.6246	819.27166	573.6602	200
4	92	94.8	335.05245	-6703.8116	1074.4534	752.34039	200
5	92	102.4	329.1421	-6459.1838	1256.0165	879.47221	200
6	92	110	323.52315	-6232.6426	1420.2458	994.46678	200
7	92	117.6	318.1803	-6023.4027	1571.9501	1100.6913	200

8	92	125.2	313.1001	-5830.4699	1714.9219	1200.8012	200
9	92	133.2635	307.99165	-5643.4118	1853.2304	1297.6459	200
10	92	141.7905	302.8738	-5463.2883	1989.653	1393.17	200
11	92	150.3175	298.04375	-5301.2156	2124.5761	1487.6442	200
12	92	158.8445	293.48955	-5156.2418	2258.7257	1581.5767	200
13	92	167.3715	289.20045	-5027.9122	2391.2123	1674.3449	200
14	92	175.1958	285.4804	-4904.5383	2509.8503	1757.4161	200
15	92	182.31745	282.2846	-4783.316	2611.3743	1828.5039	200
16	92	189.43915	279.25695	-4672.5667	2703.4423	1892.9707	200
17	92	196.8692	276.27645	-4568.2195	2773.9704	1942.355	200
18	92	204.60755	273.35345	-4470.8915	2814.7271	1970.8931	200
19	92	212.3459	270.61485	-4384.9181	2824.282	1977.5835	200
20	92	220.0843	268.0566	-4310.3788	2795.7384	1957.5971	200
21	92	227.82265	265.675	-4246.7882	2723.2373	1906.8313	200
22	92	235.561	263.4667	-4193.9624	2602.5173	1822.3023	200
23	92	243.2994	261.4287	-4151.7816	2431.8544	1702.8028	200
24	92	251.03775	259.55825	-4120.0747	2211.7607	1548.6915	200
25	92	258.7761	257.8529	-4098.6209	1945.9185	1362.5468	200
26	92	266.5145	256.3105	-4087.4075	1639.9661	1148.3166	200
27	92	274.25285	254.9291	-4086.2563	1301.7654	911.50595	200
28	92	281.9912	253.7069	-4094.9493	939.56792	657.89254	200
29	92	289.7296	252.64245	-4113.4902	562.04924	393.55111	200
30	92	297.46795	251.73445	-4141.849	176.78827	123.78848	200


Select Fill Soil
2H:1V Fill Slope
Rockery
Vault
Dense Native Soil
ES-2660.01 Vuecrest Estates
Proposed Vault, Static Condition
July 11, 2013
By HTW
Elevation
Distance
400
390
380
370
360
350
340
330
320
310
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390 400


2.040
Select Fill Soil
2H:1V Fill Slope
Rockery
Vault
Dense Native Soil
ES-2660.01 Vuecrest Estates
Proposed Vault, Static Condition
July 11, 2013
By HTW
Elevation
Distance
400 390 380 370 360 350 340 330 320 310 300 290 280 270 260 250 240 230 220 210 200 190 180 170 160 150
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390 400

Slope Stability

File Information

Title: Vuecrest
Created By: Henry Wright
Revision Number: 4
Last Edited By: Henry Wright
Date: 7/11/2013
Time: 10:19:00 AM
File Name: Vuecrest Vault, Static Condition.gsz
Directory: C:\Users\henry.wright\Documents\Earth Solutions\2734 LnL\
Last Solved Date: 7/11/2013
Last Solved Time: 10:19:02 AM

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

Slope Stability

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Apply Phreatic Correction: No
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: Piezometric Line
Use Staged Rapid Drawdown: No
Slip Surface
Direction of movement: Left to Right
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: No
Tension Crack
Tension Crack Option: (none)
FOS Distribution

FOS Calculation Option: Constant

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Dense Native Soil

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 200 psf
Phi: 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Select Fill Soil

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion: 0 psf
Phi: 32 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Rockery

Model: Mohr-Coulomb
Unit Weight: 140 pcf
Cohesion: 0 psf
Phi: 40 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Vault

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion: 0 psf
Phi: 40 °
Phi-B: 0 °
Pore Water Pressure

Piezometric Line: 1

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (0.48447, 373) ft
Left-Zone Right Coordinate: (93.08109, 351.06899) ft
Left-Zone Increment: 4
Right Projection: Range
Right-Zone Left Coordinate: (99.10306, 348.37495) ft
Right-Zone Right Coordinate: (400, 250) ft
Right-Zone Increment: 4
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (0, 373) ft
Right Coordinate: (400, 250) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
	0	249.88736
	46.27953	240.31824
	171.63495	207.50984
	302.86855	184.40726
	400	183.45035

Regions

	Material	Points	Area (ft²)
Region 1	Dense Native Soil	2,1,16,15,14,13,10,9,5,4,3	60469.5
Region 2	Rockery	13,12,11,10	18
Region 3	Select Fill Soil	8,9,10,11	96
Region 4	Vault	7,8,9,5,4,6	1400

Points

	X (ft)	Y (ft)
Point 1	400	250
Point 2	400	150
Point 3	0	150

Point 4	0	353
Point 5	70	353
Point 6	0	373
Point 7	70	373
Point 8	70	364
Point 9	70	356
Point 10	86	352
Point 11	86	356
Point 12	90	356
Point 13	91	352
Point 14	129	335
Point 15	193	305
Point 16	304	250

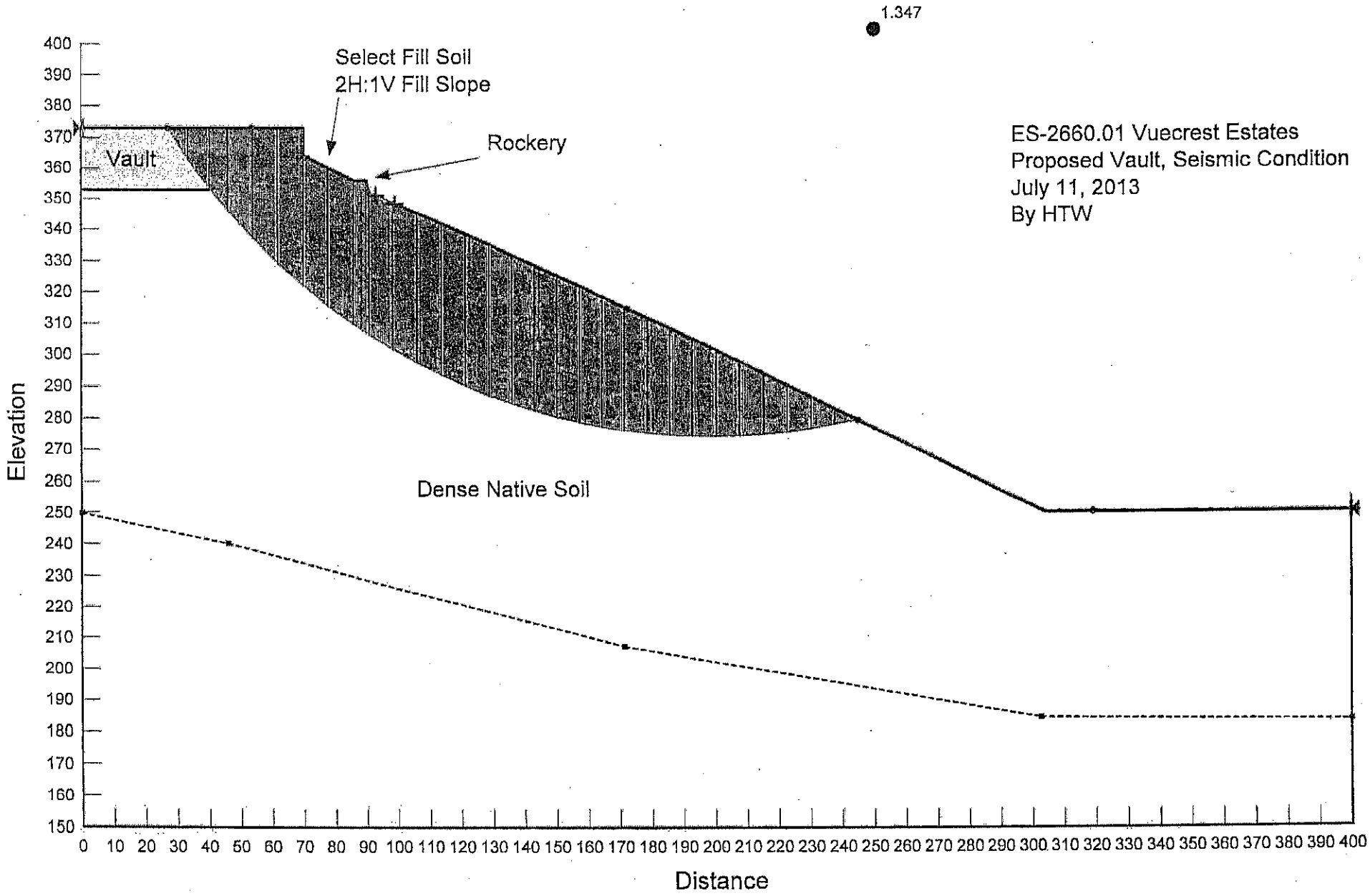
Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	52	1.585	(113.173, 428.033)	80.891	(53.888, 373)	(99.1031, 348.375)

Slices of Slip Surface: 52

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	52	54.620345	372.2315	-8367.3751	48.419148	40.628489	0
2	52	56.085075	370.73335	-8297.9264	142.13893	119.26872	0
3	52	57.549805	369.31	-8233.396	230.62034	193.51344	0
4	52	59.014535	367.9561	-8172.6971	315.35648	264.6155	0
5	52	60.479265	366.667	-8115.991	397.67786	333.69135	0
6	52	61.943995	365.4387	-8063.3828	478.73628	401.70743	0
7	52	63.408725	364.26775	-8013.9892	559.52607	469.49812	0
8	52	64.87345	363.151	-7968.6751	640.95508	537.82517	0
9	52	66.338175	362.0857	-7925.8304	723.67246	607.23329	0
10	52	67.802905	361.0694	-7886.3168	808.30084	678.24494	0
11	52	69.267635	360.09985	-7849.6851	895.23107	751.18806	0
12	52	70.732515	359.175	-7816.0182	402.82913	251.71558	0
13	52	72.197545	358.2931	-7784.8674	428.55024	267.78791	0
14	52	73.662575	357.45265	-7756.5782	452.51173	282.76071	0
15	52	75.127605	356.6522	-7730.0896	474.52739	296.51762	0
16	52	76.59264	355.89035	-7706.6564	494.31817	308.88428	0
17	52	78.057675	355.1659	-7685.6526	511.49343	319.61657	0
18	52	79.522705	354.4778	-7666.3621	525.58433	328.42154	0
19	52	80.987735	353.82495	-7649.8599	536.04126	334.95575	0
20	52	82.452765	353.2065	-7635.3086	542.28245	338.85568	0
21	52	83.917795	352.6216	-7622.4392	543.68902	339.73461	0
22	52	85.325155	352.08995	-7612.1405	554.02442	387.93208	200
23	52	86.666665	351.61125	-7604.5681	611.88713	428.44798	200

24	52	88	351.1617	-7597.9772	666.6334	466.78174	200
25	52	89.333335	350.7378	-7593.2892	715.3674	500.90564	200
26	52	90.5	350.3862	-7590.4166	493.92327	345.8488	200
27	52	91.810305	350.0183	-7588.6478	227.45113	159.263	200
28	52	93.430915	349.59245	-7588.7771	181.46165	127.06082	200
29	52	95.05153	349.20225	-7591.0423	129.1253	90.414505	200
30	52	96.672145	348.84715	-7595.0331	71.709725	50.21169	200
31	52	98.292755	348.5266	-7601.5117	10.5401	7.3802573	200


1.347
Select Fill Soil
2H:1V Fill Slope
Rockery
Vault
Dense Native Soil
ES-2660.01 Vuecrest Estates
Proposed Vault, Seismic Condition
July 11, 2013
By HTW
Elevation
Distance
400
390
380
370
360
350
340
330
320
310
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390 400

Slope Stability

File Information

Title: Vuecrest
Created By: Henry Wright
Revision Number: 7
Last Edited By: Henry Wright
Date: 7/11/2013
Time: 10:25:06 AM
File Name: Vuecrest Vault, Seismic Condition.gsz
Directory: C:\Users\henry.wright\Documents\SlopeW\Vuecrest Estates\
Last Solved Date: 7/11/2013
Last Solved Time: 10:25:08 AM

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

Slope Stability

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
- Apply Phreatic Correction: No
- Side Function
  - Interslice force function option: Half-Sine
- PWP Conditions Source: Piezometric Line
- Use Staged Rapid Drawdown: No

Slip Surface
- Direction of movement: Left to Right
- Use Passive Mode: No
- Slip Surface Option: Entry and Exit
- Critical slip surfaces saved: 1
- Optimize Critical Slip Surface Location: No
- Tension Crack
  - Tension Crack Option: (none)

FOS Distribution

FOS Calculation Option: Constant

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Dense Native Soil

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 200 psf
Phi: 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Select Fill Soil

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion: 0 psf
Phi: 32 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Rockery

Model: Mohr-Coulomb
Unit Weight: 140 pcf
Cohesion: 0 psf
Phi: 40 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Vault

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion: 0 psf
Phi: 40 °
Phi-B: 0 °
Pore Water Pressure

Piezometric Line: 1

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (0.48447, 373) ft
Left-Zone Right Coordinate: (93.08109, 351.06899) ft
Left-Zone Increment: 4
Right Projection: Range
Right-Zone Left Coordinate: (99.10306, 348.37495) ft
Right-Zone Right Coordinate: (400, 250) ft
Right-Zone Increment: 4
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (0, 373) ft
Right Coordinate: (400, 250) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
	0	249.88736
	46.27953	240.31824
	171.63495	207.50984
	302.86855	184.40726
	400	183.45035

Seismic Loads

Horz Seismic Load: 0.2
Ignore seismic load in strength: No

Regions

	Material	Points	Area (ft^2)
Region 1	Dense Native Soil	2,1,16,15,14,13,10,9,5,4,3	60469.5
Region 2	Rockery	13,12,11,10	18
Region 3	Select Fill Soil	8,9,10,11	96
Region 4	Vault	7,8,9,5,4,6	1400

Points

	X (ft)	Y (ft)
Point 1	400	250
Point 2	400	150
Point 3	0	150
Point 4	0	353
Point 5	70	353
Point 6	0	373
Point 7	70	373
Point 8	70	364
Point 9	70	356
Point 10	86	352
Point 11	86	356
Point 12	90	356
Point 13	91	352
Point 14	129	335
Point 15	193	305
Point 16	304	250

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	52	1.090	(113.173, 428.033)	80.891	(53.888, 373)	(99.1031, 348.375)

Slices of Slip Surface: 52

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	52	54.620345	372.2315	-8367.3751	41.177	34.551605	0
2	52	56.085075	370.73335	-8297.9264	119.60583	100.36121	0
3	52	57.549805	369.31	-8233.396	191.82014	160.9562	0
4	52	59.014535	367.9561	-8172.6971	259.52129	217.76422	0
5	52	60.479265	366.667	-8115.991	324.28742	272.10946	0
6	52	61.943995	365.4387	-8063.3828	387.62037	325.25211	0
7	52	63.408725	364.26775	-8013.9892	450.97931	378.41657	0
8	52	64.87345	363.151	-7968.6751	515.76512	432.77832	0
9	52	66.338175	362.0857	-7925.8304	583.34646	489.4858	0
10	52	67.802905	361.0694	-7886.3168	654.9605	549.57711	0
11	52	69.267635	360.09985	-7849.6851	731.81542	614.06605	0
12	52	70.732515	359.175	-7816.0182	308.4047	192.71265	0
13	52	72.197545	358.2931	-7784.8674	334.62924	209.09956	0
14	52	73.662575	357.45265	-7756.5782	361.85453	226.1118	0
15	52	75.127605	356.6522	-7730.0896	390.06443	243.73931	0
16	52	76.59264	355.89035	-7706.6564	419.0171	261.83094	0
17	52	78.057675	355.1659	-7685.6526	448.19548	280.06362	0

18	52	79.522705	354.4778	-7666.3621	476.81532	297.94728	0
19	52	80.987735	353.82495	-7649.8599	503.82243	314.82319	0
20	52	82.452765	353.2065	-7635.3086	527.93625	329.89118	0
21	52	83.917795	352.6216	-7622.4392	547.70452	342.24377	0
22	52	85.325155	352.08995	-7612.1405	630.5632	441.52511	200
23	52	86.666665	351.61125	-7604.5681	687.56435	481.43774	200
24	52	88	351.1617	-7597.9772	738.12994	516.84415	200
25	52	89.333335	350.7378	-7593.2892	779.53947	545.83941	200
26	52	90.5	350.3862	-7590.4166	560.18607	392.24651	200
27	52	91.810305	350.0183	-7588.6478	291.99422	204.45655	200
28	52	93.430915	349.59245	-7588.7771	229.63201	160.79007	200
29	52	95.05153	349.20225	-7591.0423	159.84908	111.92753	200
30	52	96.672145	348.84715	-7595.0331	85.434306	59.821745	200
31	52	98.292755	348.5266	-7601.5117	8.9886223	6.2939011	200

Elizabeth Higgins

From: Henry Wright <Henry.Wright@earthsolutionsnw.com>
Sent: Monday, July 15, 2013 12:37 PM
To: Elizabeth Higgins
Cc: Kyle Campbell
Subject: RE: Vuecrest Slope Analysis

Hi Elizabeth,

Our letter is being reviewed by Kyle (the PE for the job), however he will be out of office for most of the day. We should be able to get that out by tomorrow. That being said, we ran two more slope analyses, one with the vault condition, and one with the proposed residence condition (rockery adjacent to slope with 2:1 partial fill slope above). Based on the results of our study, the proposed development has a negligible effect on the slope stability. In the updated letter, we also address proper placement of fill on slopes. If the fill slope is properly constructed, and erosion control measures are properly implemented, the development is feasible from a geotechnical standpoint. Sorry for the delay, I hope this helps clarify our findings. Please let me know if you have any questions, comments, or concerns.

Thank you,

Henry T. Wright, E.I.T.
Staff Engineer
Earth Solutions NW, LLC

1805 136th Place NE, Suite 201 • Bellevue, WA 98005
Office (425) 449-4704 • Fax (425) 449-4711
Cell (206) 793-4193 • Radio ID 112*71686*5

From: Elizabeth Higgins [mailto:EHiggins@Rentonwa.gov]
Sent: Monday, July 15, 2013 10:48 AM
To: Henry Wright
Subject: RE: Vuecrest Slope Analysis

"ASAP" being a relative term, when might we expect an updated letter? As I mentioned in my telephone message of earlier this morning, I will be presenting this project to the City of Renton Environmental Review Committee at 3 pm today. I will be basing staff recommendations on the ESNW report, as it now stands.

Thank you!

Elizabeth River Higgins
Department of Community and Economic Development
City of Renton
1055 South Grady Way
Renton WA 98057

425-430-6581

From: Henry Wright [mailto:Henry.Wright@earthsolutionsnw.com]
Sent: Tuesday, July 09, 2013 9:09 AM
To: Elizabeth Higgins

EXHIBIT 25

Cc: Kyle Campbell
Subject: RE: Vuecrest Slope Analysis

Hi Elizabeth,

We will address the issues you have raised and reevaluate the proposed development near the slope. We will try to have an updated letter prepared ASAP.

Thank you,

Henry T. Wright, E.I.T.
Staff Engineer
Earth Solutions NW, LLC

1805 136th Place NE, Suite 201 • Bellevue, WA 98005
Office (425) 449-4704 • Fax (425) 449-4711
Cell (206) 793-4193 • Radio ID 112*71686*5

From: Elizabeth Higgins [mailto:EHiggins@Rentonwa.gov]
Sent: Monday, July 08, 2013 1:45 PM
To: Henry Wright
Subject: Vuecrest Slope Analysis

Mr. Wright
One other item needs clarification. In your letter of April 10th, on page 2 you cite RMC 4-3-050J.2, specifically subsection b) The required studies shall demonstrate the following review criteria can be met: "i) The proposal will not increase the threat of the geological hazard to adjacent or abutting properties beyond pre-development conditions." There are two additional conditions that must be met, ii) The proposal will not adversely impact other critical areas; and iii) The development can be safely accommodated on the site.

We would appreciate having the ESNW statement of assurance expanded to include the additional criteria.

Thank you.

Elizabeth River Higgins
Department of Community and Economic Development
City of Renton
1055 South Grady Way
Renton WA 98057

425-430-6581

April 10, 2013
ES-2660.01

Earth Solutions NW LLC

- Geotechnical Engineering
- Construction Monitoring
- Environmental Sciences

Geonerco Properties, LLC
1441 North 34th Street, #200
Seattle, Washington 98103

Attention: Mr. Jamie Waltier

Subject: **Slope Setback**
Smithers Avenue Residential Plat
Renton, Washington

Reference: Earth Solutions NW, LLC
Geotechnical Engineering Study
ES-2660, dated February 2013

Dear Mr. Waltier:

As requested, Earth Solutions NW, LLC (ESNW) has prepared this letter to address the setback from the top of a slope. ESNW previously prepared the referenced geotechnical engineering study for the site.

Site Conditions

The City of Renton Municipal Code defines steep slopes as follows:

- Sensitive Slopes: Areas with slopes between 25 percent and 40 percent.
- Protected Slopes: Areas with slopes greater than 40 percent.

Based on our observations and review of the referenced topographic survey, sensitive slopes are present along the western and southern portions of the property, and protected slopes are present along the western portion of the property.

The referenced geotechnical engineering study identifies soil conditions onsite to consist of glacial till which becomes dense to very dense near the surface.

EXHIBIT 26

Proposed Development Adjacent to Slopes

We understand that the proposed development will incorporate a three to four foot rockery as well as a stormwater vault structure near the top of a slope at the west side of the subject property. The rockery will be located adjacent to the top of the slope, and will be facing a 2:1 partial fill slope above. Single family residences will be located with a 20 foot setback from the top of the natural slope. The proposed stormwater vault is to be located with a 10 foot setback from the top of the natural slope near the southwest portion of the subject property.

Section 4-3-050-J-2 of The City of Renton Municipal Code requires that development within 50 feet of a sensitive or protected slope must demonstrate "[t]he proposal will not increase the threat of the geologic hazard to adjacent or abutting properties beyond pre-development conditions". We performed a slope analysis of the proposed development, utilizing soil condition data, visual slope reconnaissance information, existing topography, and proposed topography and development.

Based on the results of our slope analysis, and our understanding of the proposed development, in our opinion, the proposed development is feasible from a geotechnical standpoint. In our opinion, the proposed development will not increase the threat of the geologic hazard to adjacent or abutting properties beyond pre-development conditions.

If you have any questions, or if additional information is required, please call.

Sincerely,

EARTH SOLUTIONS NW, LLC

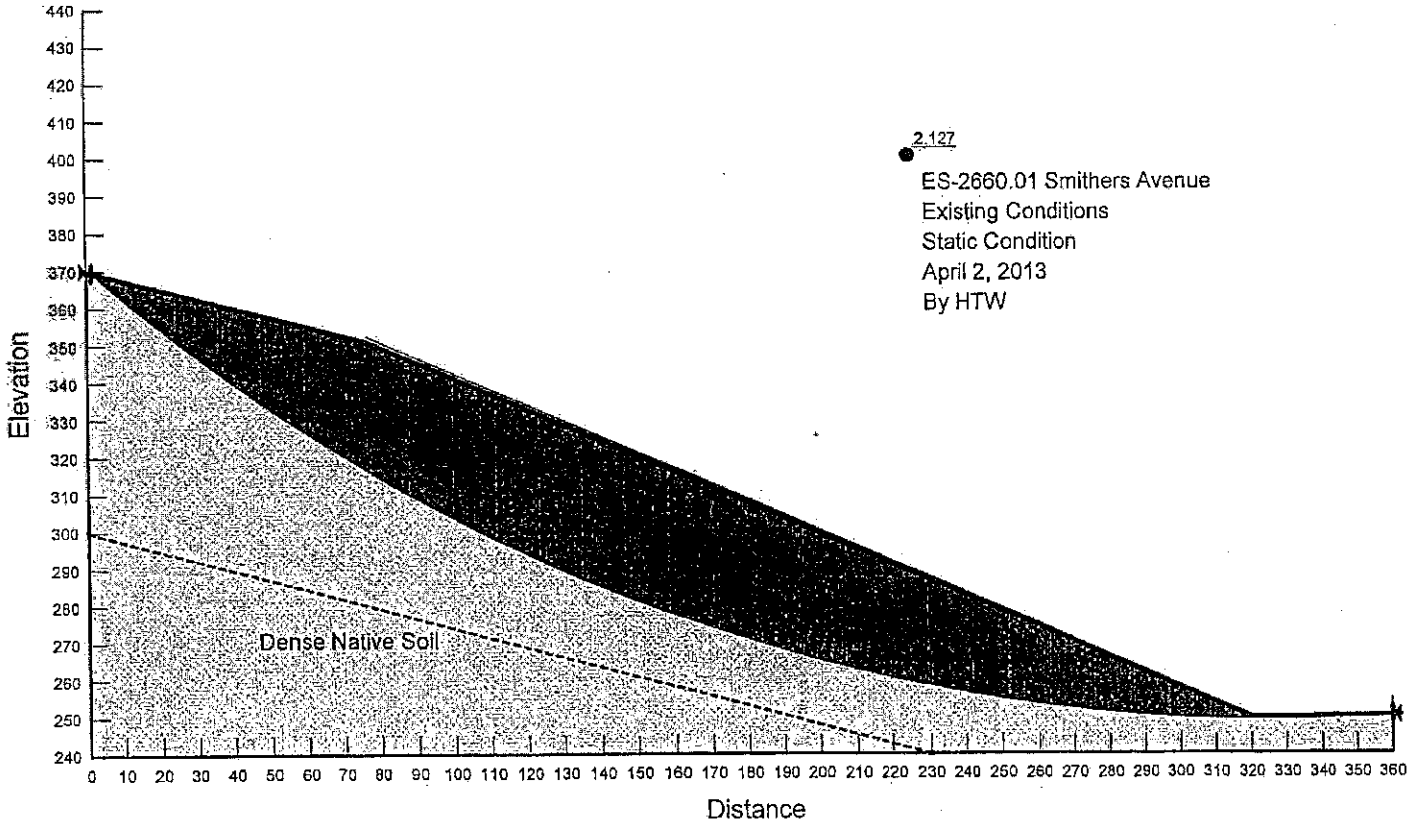
KYLE R. CAMPBELL
STATE OF WASHINGTON
2767
REGISTERED
PROFESSIONAL ENGINEER
4/10/13

Henry T. Wright, E.I.T.
Staff Engineer

Kyle R. Campbell, P.E.
Principal

Attachments: Slope Analysis Data

cc: DR Strong Consulting Engineers, Inc.
Attention: Mr. Maher Joudi (Email only)


2.127
ES-2660.01 Smithers Avenue
Existing Conditions
Static Condition
April 2, 2013
By HTW
Dense Native Soil
Elevation
Distance
440
430
420
410
400
390
380
370
360
350
340
330
320
310
300
290
280
270
260
250
240
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360

SLOPE/W Analysis

File Information

Created By: Henry Wright
Revision Number: 11
Last Edited By: Henry Wright
Date: 4/2/2013
Time: 9:54:19 AM
File Name: Smithers Ave Existing Conditions, Static Condition.gsz
Directory: C:\Users\henry.wright\Documents\SlopeW\2660.01\
Last Solved Date: 4/2/2013
Last Solved Time: 9:54:23 AM

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

SLOPE/W Analysis

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
    Apply Phreatic Correction: No
    Side Function
        Interslice force function option: Half-Sine
    PWP Conditions Source: Piezometric Line
    Use Staged Rapid Drawdown: No
SlipSurface
    Direction of movement: Left to Right
    Allow Passive Mode: No
    Slip Surface Option: Entry and Exit
    Critical slip surfaces saved: 1
    Optimize Critical Slip Surface Location: No
    Tension Crack
        Tension Crack Option: (none)
FOS Distribution
    FOS Calculation Option: Constant

Advanced
Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1

Materials

Dense Native Soil

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 200 psf
Phi: 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (1.532689, 369.70445) ft
Left-Zone Right Coordinate: (360.14795, 250.15967) ft
Left-Zone Increment: 4
Right Projection: Point
Right Coordinate: (360.15693, 250.1598) ft
Right-Zone Increment: 4
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (0.1023189, 370.06196) ft
Right Coordinate: (360.15693, 250.1598) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
	0.1378248	299.92062
	229.98263	239.93476

Seismic Loads

Horz Seismic Load: 0

Regions

	Material	Points	Area (ft^2)
Region 1	Dense Native Soil	1,2,3,4,5,6,7	24331.82

Points

	X (ft)	Y (ft)
Point 1	360.15693	239.90718
Point 2	360.15693	250.1598
Point 3	320.34257	249.56173
Point 4	76.861983	350.99278
Point 5	71.583836	352.19544
Point 6	0.1023189	370.06196
Point 7	0.1681653	239.98345

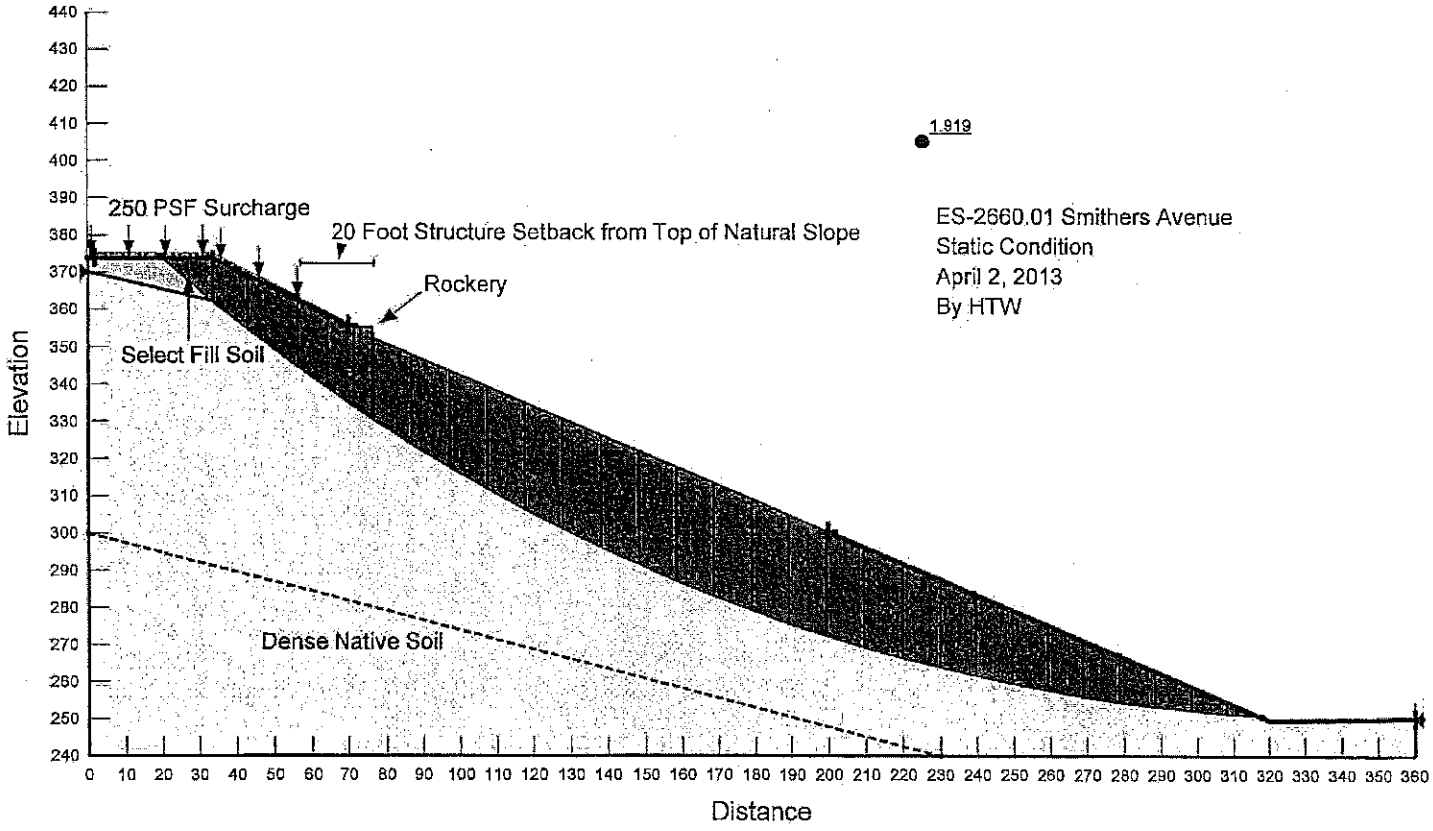
Critical Slip Surfaces

	Number	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	2	2.127	(325.704, 744.497)	495.536	(1.53269, 369.704)	(360.157, 250.16)

Slices of Slip Surface: 2

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	2	7.3702845	364.8101	-4166.921	273.25277	191.33365	200
2	2	19.045475	355.31605	-3764.5686	911.52386	638.25588	200
3	2	30.720665	346.39085	-3397.782	1488.7533	1042.4363	200
4	2	42.395855	337.9969	-3064.1643	2015.6757	1411.3913	200
5	2	54.07105	330.1019	-2761.6263	2501.0942	1751.285	200
6	2	65.746245	322.67785	-2488.5083	2952.2598	2067.1946	200
7	2	74.22291	317.5259	-2305.072	3271.6678	2290.8464	200
8	2	82.751235	312.6582	-2140.2008	3473.4236	2432.1174	200
9	2	94.529745	306.2384	-1931.4109	3666.9022	2567.5926	200
10	2	106.30825	300.22365	-1747.9622	3835.2857	2685.4959	200
11	2	118.08675	294.59765	-1588.7063	3978.7422	2785.9453	200
12	2	129.86525	289.3459	-1452.8323	4096.5363	2868.4256	200
13	2	141.6438	284.45565	-1339.4807	4186.8131	2931.6381	200
14	2	153.42235	279.9155	-1248.0199	4247.1522	2973.888	200
15	2	165.20085	275.7152	-1177.6934	4274.3796	2992.9528	200
16	2	176.97935	271.8457	-1128.0506	4264.5481	2986.0687	200
17	2	188.75785	268.29895	-1098.5729	4213.5624	2950.3682	200

18	2	200.53635	265.06775	-1088.7754	4117.2861	2882.9548	200
19	2	212.31485	262.1458	-1098.2199	3971.3775	2780.7885	200
20	2	224.09335	259.5275	-1126.6999	3772.2303	2641.3441	200
21	2	235.6301	257.2496	0	3523.2193	2466.9847	200
22	2	246.9251	255.29615	0	3225.3807	2258.4359	200
23	2	258.2201	253.6103	0	2873.9907	2012.3899	200
24	2	269.5151	252.18935	0	2470.2858	1729.7128	200
25	2	280.8101	251.031	0	2016.5514	1412.0045	200
26	2	292.1051	250.1334	0	1516.9088	1062.151	200
27	2	303.4001	249.4951	0	976.25692	683.58245	200
28	2	314.6951	249.1151	0	400.81326	280.65246	200
29	2	326.9783	249.0067	0	112.15763	78.533619	200
30	2	340.24975	249.2187	0	101.90417	71.354068	200
31	2	353.5212	249.7867	0	45.720042	32.013518	200


1.919
250 PSF Surcharge
20 Foot Structure Setback from Top of Natural Slope
Rockery
Select Fill Soil
Dense Native Soil
ES-2660.01 Smithers Avenue
Static Condition
April 2, 2013
By HTW
Elevation
Distance
440
430
420
410
400
390
380
370
360
350
340
330
320
310
300
290
280
270
260
250
240
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360

SLOPE/W Analysis

File Information

Created By: Henry Wright
Revision Number: 13
Last Edited By: Henry Wright
Date: 4/2/2013
Time: 9:52:08 AM
File Name: Smithers Ave 3 Foot Rockery, 2 to 1 Slope Static Condition.gsz
Directory: C:\Users\henry.wright\Documents\SlopeW\2660.01\
Last Solved Date: 4/2/2013
Last Solved Time: 9:52:12 AM

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

SLOPE/W Analysis

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
    Apply Phreatic Correction: No
    Side Function
        Interslice force function option: Half-Sine
    PWP Conditions Source: Piezometric Line
    Use Staged Rapid Drawdown: No
SlipSurface
    Direction of movement: Left to Right
    Allow Passive Mode: No
    Slip Surface Option: Entry and Exit
    Critical slip surfaces saved: 1
    Optimize Critical Slip Surface Location: No
    Tension Crack
        Tension Crack Option: (none)
FOS Distribution
    FOS Calculation Option: Constant

Advanced
Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1

Materials

Dense Native Soil

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 200 psf
Phi: 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Select Fill Soil

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion: 0 psf
Phi: 32 °
Phi-B: 0 °

Rockery

Model: Mohr-Coulomb
Unit Weight: 140 pcf
Cohesion: 0 psf
Phi: 40 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (1.75904, 373.98196) ft
Left-Zone Right Coordinate: (70.0334, 355.82029) ft
Left-Zone Increment: 4
Right Projection: Range
Right-Zone Left Coordinate: (199.82186, 300.29886) ft
Right-Zone Right Coordinate: (360.15693, 250.1598) ft
Right-Zone Increment: 4
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (0.1023189, 370.06196) ft
Right Coordinate: (360.15693, 250.1598) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
	0.1378248	299.92062
	229.98263	239.93476

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 250 pcf
Direction: Vertical

Coordinates

	X (ft)	Y (ft)
	0.9875556	375.19653
	33.881393	375.1053
	56.237811	363.67271

Seismic Loads

Horz Seismic Load: 0

Regions

	Material	Points	Area (ft^2)
Region 1	Dense Native Soil	1,2,3,4,5,6,7,8,9	24470.172
Region 2	Rockery	5,4,10,11,6	20.631255
Region 3	Select Fill Soil	6,11,12,13,8,7	548.2873

Points

	X (ft)	Y (ft)
Point 1	360.15693	239.90718
Point 2	360.15693	250.1598
Point 3	320.34257	249.56173
Point 4	76.861983	352.06283

Point 5	76.861983	350.99278
Point 6	71.791243	351.01674
Point 7	43.05417	360.0836
Point 8	0.1023189	370.06196
Point 9	0.1681653	239.98345
Point 10	76.501308	355.15984
Point 11	71.596931	355.04006
Point 12	33.684832	373.95884
Point 13	0.1598139	373.98312

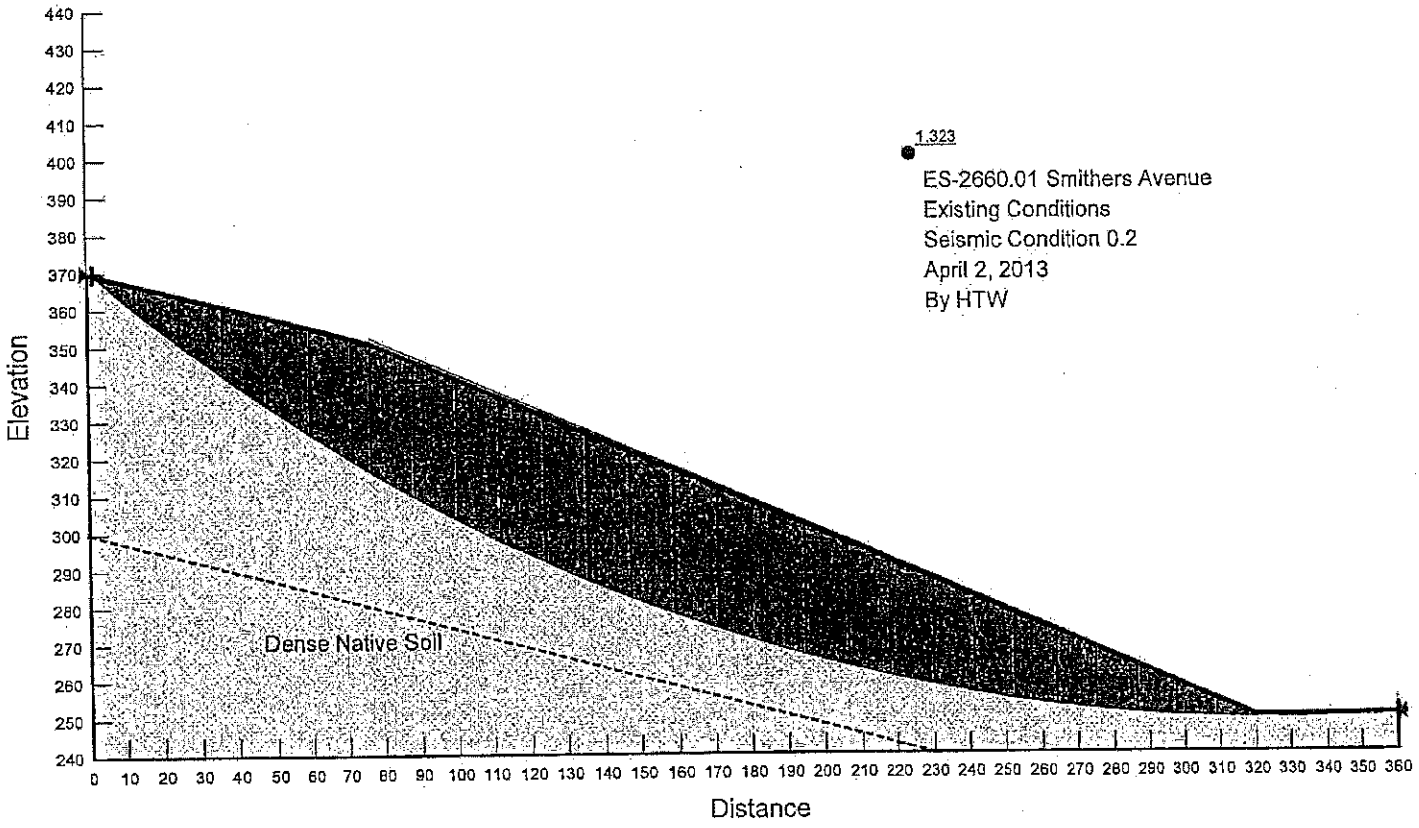
Critical Slip Surfaces

	Number	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	47	1.919	(344.793, 737.405)	487.488	(19.8962, 373.969)	(317.709, 250.671)

Slices of Slip Surface: **47**

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	47	26.79053	368.0333	0	804.08119	502.44569	0
2	47	33.78311	362.0164	-4422.5686	1296.8402	908.05728	200
3	47	38.46778	358.22975	-4262.6735	1418.234	993.05816	200
4	47	49.64599	349.50885	-3900.5536	1661.5246	1163.4121	200
5	47	60.07759	341.7302	-3585.1079	1691.5613	1184.444	200
6	47	67.75715	336.31505	-3372.205	1835.1378	1284.9773	200
7	47	74.04912	332.02515	-3207.0542	2096.607	1468.0601	200
8	47	76.681645	330.26865	-3140.1664	2107.7854	1475.8873	200
9	47	81.966005	326.88215	-3015.0401	2056.8605	1440.2292	200
10	47	92.17405	320.5215	-2784.3522	2276.1413	1593.7713	200
11	47	102.38208	314.50295	-2575.0139	2476.0861	1733.7741	200
12	47	112.59015	308.81205	-2386.145	2658.1533	1861.259	200
13	47	122.7982	303.43585	-2216.9642	2822.8356	1976.5708	200
14	47	133.0062	298.3628	-2066.5875	2970.0026	2079.6182	200
15	47	143.21425	293.5825	-1934.6017	3098.2169	2169.3949	200
16	47	153.4223	289.0856	-1820.2278	3205.648	2244.6189	200
17	47	163.63035	284.86365	-1722.9572	3289.5796	2303.3884	200
18	47	173.8384	280.90895	-1642.4198	3346.8558	2343.4937	200
19	47	184.04645	277.21465	-1578.209	3373.4737	2362.1317	200
20	47	194.2545	273.77455	-1529.7219	3365.7981	2356.7572	200
21	47	204.4625	270.583	-1496.815	3319.6364	2324.4344	200
22	47	214.67055	267.6349	-1479.1724	3231.6536	2262.8282	200
23	47	224.8786	264.9257	-1476.3077	3098.9358	2169.8982	200
24	47	234.85625	262.5021	0	2924.4144	2047.697	200
25	47	244.6036	260.35035	0	2710.1517	1897.6687	200
26	47	254.35095	258.40655	0	2453.5397	1717.987	200
27	47	264.09825	256.66825	0	2156.6861	1510.1279	200

28	47	273.84555	255.1332	0	1822.9383	1276.4351	200
29	47	283.59285	253.79945	0	1456.4801	1019.8383	200
30	47	293.34015	252.6654	0	1062.3263	743.84889	200
31	47	303.0875	251.7296	0	646.13907	452.43145	200
32	47	312.83485	250.99085	0	213.27082	149.33384	200


1.323
ES-2660.01 Smithers Avenue
Existing Conditions
Seismic Condition 0.2
April 2, 2013
By HTW
Dense Native Soil
Elevation
Distance
440
430
420
410
400
390
380
370
360
350
340
330
320
310
300
290
280
270
260
250
240
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360

SLOPE/W Analysis

File Information

Created By: Henry Wright
Revision Number: 10
Last Edited By: Henry Wright
Date: 4/2/2013
Time: 9:53:02 AM
File Name: Smithers Ave Existing Conditions, Seismic Condition.gsz
Directory: C:\Users\henry.wright\Documents\SlopeW\2660.01\
Last Solved Date: 4/2/2013
Last Solved Time: 9:53:04 AM

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

SLOPE/W Analysis

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Apply Phreatic Correction: No
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: Piezometric Line
Use Staged Rapid Drawdown: No
SlipSurface
Direction of movement: Left to Right
Allow Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: No
Tension Crack
Tension Crack Option: (none)
FOS Distribution
FOS Calculation Option: Constant

Advanced
Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1

Materials

Dense Native Soil

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 200 psf
Phi: 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (1.532689, 369.70445) ft
Left-Zone Right Coordinate: (360.14795, 250.15967) ft
Left-Zone Increment: 4
Right Projection: Point
Right Coordinate: (360.15693, 250.1598) ft
Right-Zone Increment: 4
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (0.1023189, 370.06196) ft
Right Coordinate: (360.15693, 250.1598) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
	0.1378248	299.92062
	229.98263	239.93476

Seismic Loads

Horz Seismic Load: 0.2
Ignore seismic load in strength: No

Regions

	Material	Points	Area (ft^2)
Region 1	Dense Native Soil	1,2,3,4,5,6,7	24331.82

Points

	X (ft)	Y (ft)
Point 1	360.15693	239.90718
Point 2	360.15693	250.1598
Point 3	320.34257	249.56173
Point 4	76.861983	350.99278
Point 5	71.583836	352.19544
Point 6	0.1023189	370.06196
Point 7	0.1681653	239.98345

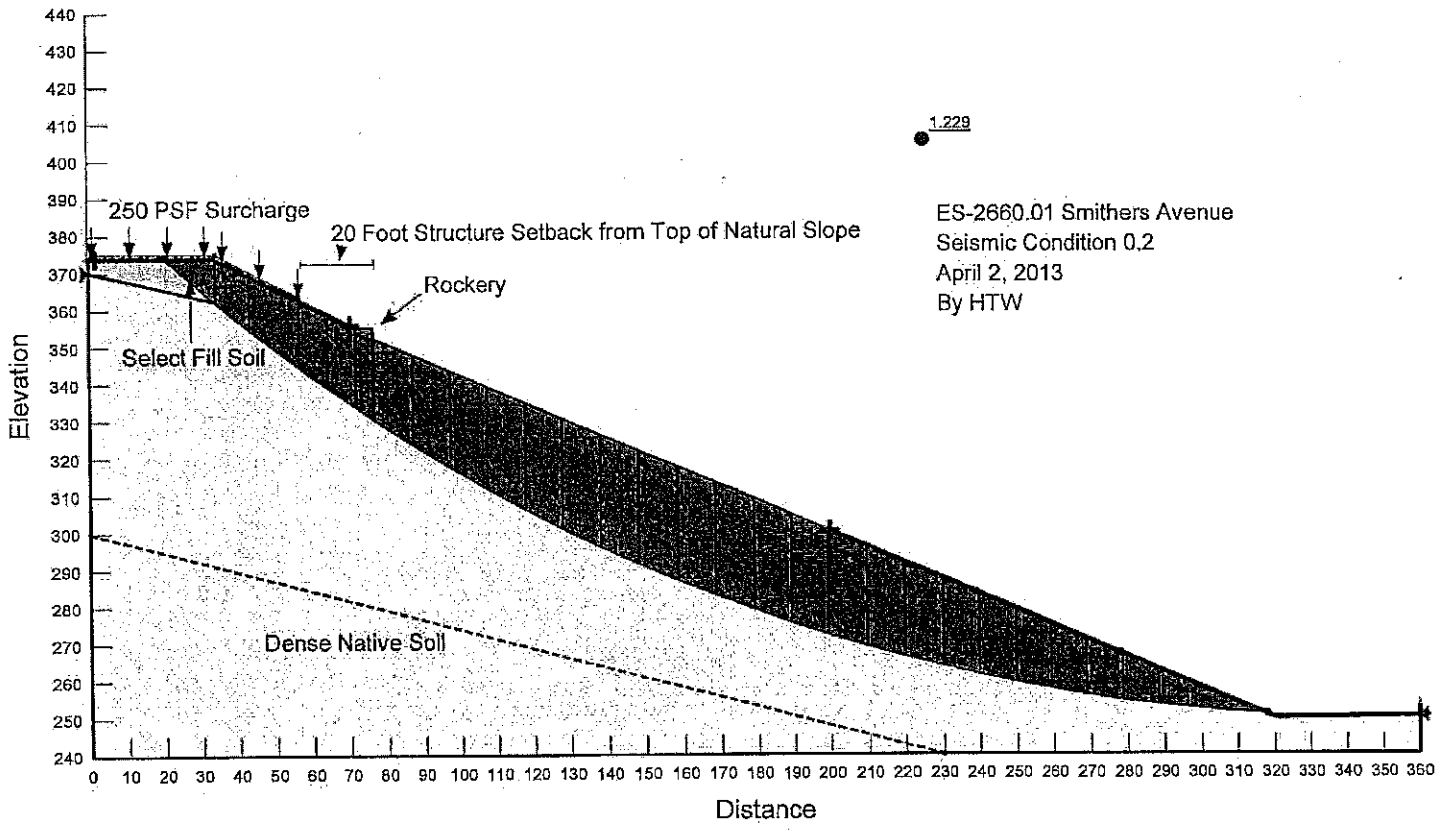
Critical Slip Surfaces

	Number	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	2	1.323	(325.704, 744.497)	495.536	(1.53269, 369.704)	(360.157, 250.16)

Slices of Slip Surface: 2

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	2	7.3702845	364.8101	-4166.921	209.65876	146.80464	200
2	2	19.045475	355.31605	-3764.5686	769.10036	538.52987	200
3	2	30.720665	346.39085	-3397.782	1264.1981	885.20107	200
4	2	42.395855	337.9969	-3064.1643	1708.5284	1196.3245	200
5	2	54.07105	330.1019	-2761.6263	2113.627	1479.9775	200
6	2	65.746245	322.67785	-2488.5083	2489.602	1743.2381	200
7	2	74.22291	317.5259	-2305.072	2757.7608	1931.0049	200
8	2	82.751235	312.6582	-2140.2008	2928.2362	2050.3731	200
9	2	94.529745	306.2384	-1931.4109	3098.2924	2169.4477	200
10	2	106.30825	300.22365	-1747.9622	3258.4932	2281.6215	200
11	2	118.08675	294.59765	-1588.7063	3410.5267	2388.0765	200
12	2	129.86525	289.3459	-1452.8323	3554.5999	2488.9577	200
13	2	141.6438	284.45565	-1339.4807	3689.4246	2583.3629	200
14	2	153.42235	279.9155	-1248.0199	3811.6428	2668.941	200
15	2	165.20085	275.7152	-1177.6934	3916.1397	2742.1106	200
16	2	176.97935	271.8457	-1128.0506	3995.9183	2797.9721	200

17	2	188.75785	268.29895	-1098.5729	4041.9716	2830.219	200
18	2	200.53635	265.06775	-1088.7754	4044.3396	2831.8771	200
19	2	212.31485	262.1458	-1098.2199	3992.2047	2795.3718	200
20	2	224.09335	259.5275	-1126.6999	3875.2694	2713.4929	200
21	2	235.6301	257.2496	0	3689.8515	2583.6619	200
22	2	246.9251	255.29615	0	3433.8504	2404.4079	200
23	2	258.2201	253.6103	0	3102.2996	2172.2536	200
24	2	269.5151	252.18935	0	2696.6166	1888.1912	200
25	2	280.8101	251.031	0	2221.9891	1555.8535	200
26	2	292.1051	250.1334	0	1687.211	1181.3979	200
27	2	303.4001	249.4951	0	1103.7947	772.8854	200
28	2	314.6951	249.1151	0	484.90942	339.53723	200
29	2	326.9783	249.0067	0	165.6934	116.01977	200
30	2	340.24975	249.2187	0	134.87051	94.437346	200
31	2	353.5212	249.7867	0	58.895972	41.239404	200


1.229
ES-2660.01 Smithers Avenue
Seismic Condition 0.2
April 2, 2013
By HTW
250 PSF Surcharge
20 Foot Structure Setback from Top of Natural Slope
Rockery
Select Fill Soil
Dense Native Soil
Elevation
Distance
440
430
420
410
400
390
380
370
360
350
340
330
320
310
300
290
280
270
260
250
240
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360

SLOPE/W Analysis

File Information

Created By: Henry Wright
Revision Number: 11
Last Edited By: Henry Wright
Date: 4/2/2013
Time: 9:50:32 AM
File Name: Smithers Ave 3 Foot Rockery, 2 to 1 Slope Seismic Condition.gsz
Directory: C:\Users\henry.wright\Documents\SlopeW\2660.01\
Last Solved Date: 4/2/2013
Last Solved Time: 9:50:34 AM

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

SLOPE/W Analysis

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
Apply Phreatic Correction: No
Side Function
Interslice force function option: Half-Sine
PWP Conditions Source: Piezometric Line
Use Staged Rapid Drawdown: No
SlipSurface
Direction of movement: Left to Right
Allow Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: No
Tension Crack
Tension Crack Option: (none)
FOS Distribution
FOS Calculation Option: Constant

Advanced
Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1

Materials

Dense Native Soil

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 200 psf
Phi: 35 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Select Fill Soil

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion: 0 psf
Phi: 32 °
Phi-B: 0 °

Rockery

Model: Mohr-Coulomb
Unit Weight: 140 pcf
Cohesion: 0 psf
Phi: 40 °
Phi-B: 0 °

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (1.75904, 373.98196) ft
Left-Zone Right Coordinate: (70.0334, 355.82029) ft
Left-Zone Increment: 4
Right Projection: Range
Right-Zone Left Coordinate: (199.82186, 300.29886) ft
Right-Zone Right Coordinate: (360.15693, 250.1598) ft
Right-Zone Increment: 4
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (0.1023189, 370.06196) ft
Right Coordinate: (360.15693, 250.1598) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
	0.1378248	299.92062
	229.98263	239.93476

Surcharge Loads

Surcharge Load 1

Surcharge (Unit Weight): 250 pcf
Direction: Vertical

Coordinates

	X (ft)	Y (ft)
	0.9875556	375.19653
	33.881393	375.1053
	56.237811	363.67271

Seismic Loads

Horz Seismic Load: 0.2
Ignore seismic load in strength: No

Regions

	Material	Points	Area (ft^2)
Region 1	Dense Native Soil	1,2,3,4,5,6,7,8,9	24470.172
Region 2	Rockery	5,4,10,11,6	20.631255
Region 3	Select Fill Soil	6,11,12,13,8,7	548.2873

Points

	X (ft)	Y (ft)
Point 1	360.15693	239.90718
Point 2	360.15693	250.1598
Point 3	320.34257	249.56173

Point 4	76.861983	352.06283
Point 5	76.861983	350.99278
Point 6	71.791243	351.01674
Point 7	43.05417	360.0836
Point 8	0.1023189	370.06196
Point 9	0.1681653	239.98345
Point 10	76.501308	355.15984
Point 11	71.596931	355.04006
Point 12	33.684832	373.95884
Point 13	0.1598139	373.98312

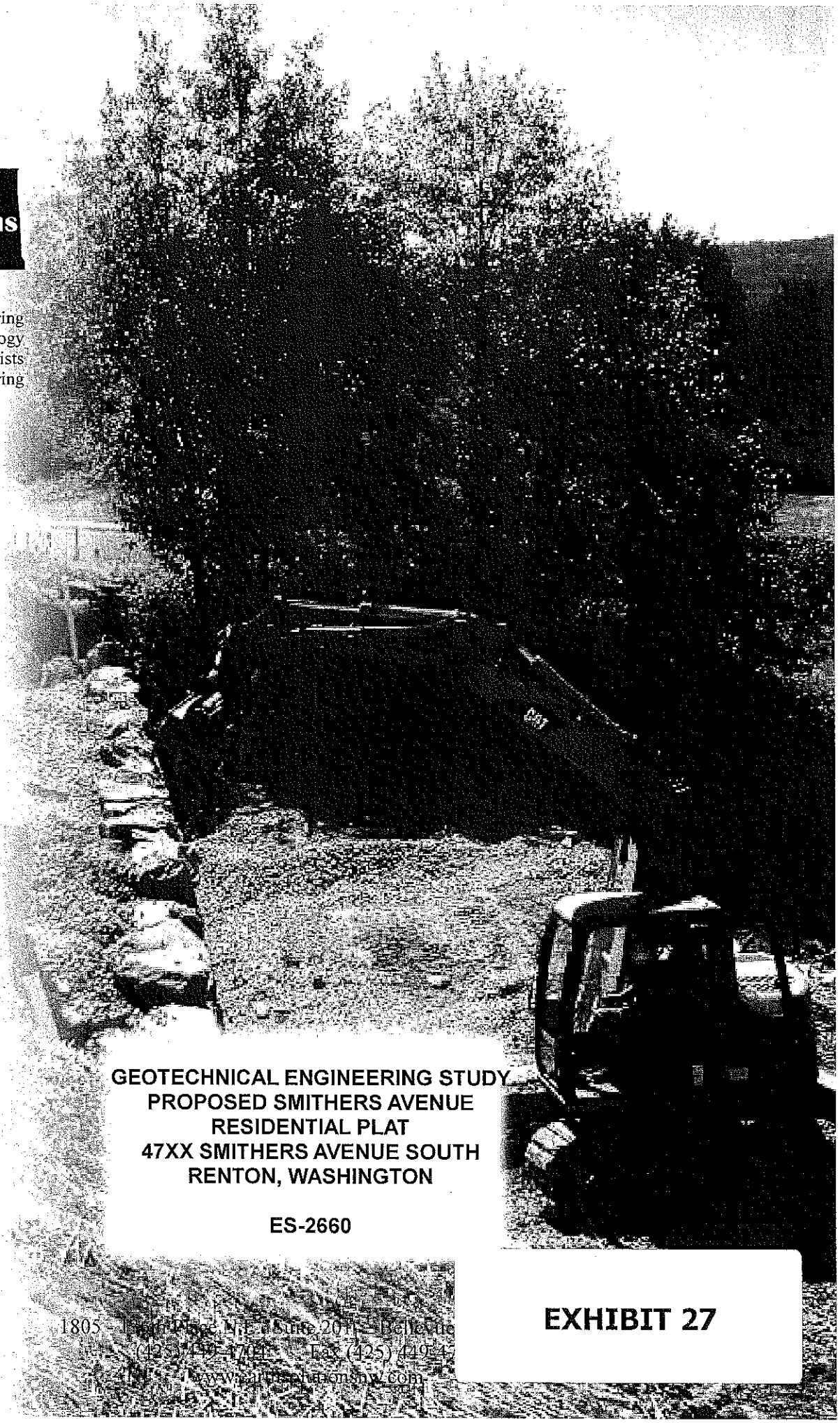
Critical Slip Surfaces

	Number	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	47	1.229	(344.793, 737.405)	487.488	(19.8962, 373.969)	(317.709, 250.671)

Slices of Slip Surface: **47**

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	47	26.79053	368.0333	0	707.67939	442.20716	0
2	47	33.78311	362.0164	-4422.5686	1099.2761	769.72139	200
3	47	38.46778	358.22975	-4262.6735	1203.0057	842.35368	200
4	47	49.64599	349.50885	-3900.5536	1406.8481	985.08563	200
5	47	60.07759	341.7302	-3585.1079	1414.9544	990.76177	200
6	47	67.75715	336.31505	-3372.205	1531.6029	1072.4399	200
7	47	74.04912	332.02515	-3207.0542	1750.8746	1225.9756	200
8	47	76.681645	330.26865	-3140.1664	1758.4098	1231.2518	200
9	47	81.966005	326.88215	-3015.0401	1712.0016	1198.7564	200
10	47	92.17405	320.5215	-2784.3522	1898.0411	1329.0227	200
11	47	102.38208	314.50295	-2575.0139	2073.1505	1451.6356	200
12	47	112.59015	308.81205	-2386.145	2240.4078	1568.7504	200
13	47	122.7982	303.43585	-2216.9642	2402.1182	1681.9813	200
14	47	133.0062	298.3628	-2066.5875	2558.838	1791.7177	200
15	47	143.21425	293.5825	-1934.6017	2710.1371	1897.6584	200
16	47	153.4223	289.0856	-1820.2278	2853.8196	1998.266	200
17	47	163.63035	284.86365	-1722.9572	2986.0044	2090.8228	200
18	47	173.8384	280.90895	-1642.4198	3101.268	2171.5313	200
19	47	184.04645	277.21465	-1578.209	3192.3935	2235.338	200
20	47	194.2545	273.77455	-1529.7219	3251.5674	2276.772	200
21	47	204.4625	270.583	-1496.815	3269.9145	2289.6188	200
22	47	214.67055	267.6349	-1479.1724	3239.395	2268.2488	200
23	47	224.8786	264.9257	-1476.3077	3152.9632	2207.7286	200
24	47	234.85625	262.5021	0	3010.2708	2107.8143	200
25	47	244.6036	260.35035	0	2812.7626	1969.5176	200
26	47	254.35095	258.40655	0	2559.3913	1792.1051	200

27	47	264.09825	256.66825	0	2254.0183	1578.2806	200
28	47	273.84555	255.1332	0	1903.1232	1332.5812	200
29	47	283.59285	253.79945	0	1514.8004	1060.6746	200
30	47	293.34015	252.6654	0	1098.2371	768.99388	200
31	47	303.0875	251.7296	0	662.26878	463.72559	200
32	47	312.83485	250.99085	0	215.18517	150.67428	200



Earth Solutions NW LLC

Geotechnical Engineering
Geology
Environmental Scientists
Construction Monitoring

GEOTECHNICAL ENGINEERING STUDY
PROPOSED SMITHERS AVENUE RESIDENTIAL PLAT
47XX SMITHERS AVENUE SOUTH
RENTON, WASHINGTON

ES-2660

1805 – 136th Place N.E., Suite 201 – Bellevue
(425) 449-4704 – FAX (425) 449-4711
www.earthsolutionsnw.com

EXHIBIT 27

PREPARED FOR

GEONERCO PROPERTIES, LLC

February 25, 2013

2/25/13

Henry T. Wright, EIT
Staff Engineer

Kyle R. Campbell, P.E.
Principal

GEOTECHNICAL ENGINEERING STUDY
PROPOSED SMITHERS AVENUE RESIDENTIAL PLAT
47XX SMITHERS AVENUE SOUTH
RENTON, WASHINGTON 98055

ES-2660

Earth Solutions NW, LLC
1805 – 136TH Place Northeast, Bellevue, Washington 98005
Ph: 425-284-3300 Fax: 425-449-4711
1-866-336-8710

Important Information About Your

Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

The following information is provided to help you manage your risks.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual

subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

Rely on Your ASFE-Member Geotechncial Engineer for Additional Assistance

Membership in ASFE/The Best People on Earth exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you ASFE-member geotechnical engineer for more information.

ASFE
The Best People on Earth

8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@asfe.org www.asfe.org

IIGER06045.0M

Earth Solutions NW LLC

- Geotechnical Engineering
- Construction Monitoring
- Environmental Sciences

February 25, 2013
ES-2660

Geonerco Properties, LLC
1441 North 34th Street, #200
Seattle, Washington 98103

Attention: Mr. Jamie Waltier

Dear Mr. Waltier:

Earth Solutions NW, LLC (ESNW) is pleased to present this report titled "Geotechnical Engineering Study, Proposed Smithers Ave Residential Plat, 47XX Smithers Avenue South, Renton, Washington 98055". This study has been prepared to address the feasibility of the proposed development from a geotechnical standpoint. The proposed 19 residential lot development is bordered to the west by a steep slope.

Based on the conditions observed during our fieldwork, the subject site is underlain primarily by native soils consisting of medium dense to very dense glacial till. Groundwater seepage was observed in one test pit at a depth of six to nine feet.

Based on the results of our study, the proposed development is feasible from a geotechnical standpoint. The residential buildings and associated structures can be supported on a conventional foundation system bearing on competent native soil or structural fill. Where loose or unsuitable soil conditions are exposed at foundation subgrade elevations, compaction of the soils to the specifications of structural fill, or overexcavation and replacement with structural fill, may be necessary.

This report provides recommendations for critical areas assessment, foundation design, structural fill recommendations, and other geotechnical recommendations.

The opportunity to be of service to you is appreciated. If you have any questions regarding the content of this geotechnical engineering study, please call.

Sincerely,

EARTH SOLUTIONS NW, LLC

2/25/13

Henry T. Wright, EIT
Staff Engineer

TABLE OF CONTENTS

ES-2660

TABLE OF CONTENTS

Continued

ES-2660

GEOTECHNICAL ENGINEERING STUDY
PROPOSED SMITHERS AVE RESIDENTIAL PLAT
47XX SMITHERS AVENUE SOUTH
RENTON, WASHINGTON 98055

ES-2660

INTRODUCTION

General

This geotechnical engineering study was prepared for the proposed 19 lot residential development on Smithers Avenue South, south of South 47th Street in Renton, Washington. The purpose of this study was to prepare geotechnical recommendations for the proposed development. To complete the scope of services detailed in our proposal PES-2660 dated January 16, 2013, we performed the following:

- Subsurface exploration and characterization of soil and groundwater conditions by way of test pits excavated on the accessible areas of the site;
- Laboratory testing of soil samples obtained during field exploration;
- Engineering analyses, and;
- Preparation of this report.

The following documents and/or resources were reviewed as part of our report preparation;

- Geologic Map of the Renton Quadrangle;
- Preliminary Site Plans Provided by the Client;
- The King County online GIS property research database;
- The City of Renton online GIS property research database, and;
- City of Renton Critical Areas Regulations (4-3-050J).

Project Description

Based on the plans provided to us, the site will be developed with 19 single family residential lots with associated roadways and stormwater facilities. Based on the City of Renton GIS data, sensitive slopes are located at the south and west portions of the site, with a protected slope at the west portion of the site. Grading activities will include cuts and fills to establish the planned building lots and access roadway alignments. Site improvements will also include underground utility installations and construction of stormwater detention facilities. Based on the preliminary site plans provided to us, we estimate cuts and fills to establish finish grades throughout the site will be on the order of two to eight feet on average. Engineered rockeries or modular block walls may also be utilized as part of the overall grading plan. A storm detention vault facility is planned to be constructed at the south end of Smithers Avenue South as part of the proposed development.

The proposed residential structures will consist of relatively lightly loaded wood framing supported on conventional foundations. Based on our experience with similar developments, we estimate wall loads on the order of 2 kips per linear foot and slab-on-grade loading of 150 pounds per square foot (psf).

If the above design assumptions are incorrect or change, ESNW should be contacted to review the recommendations in this report. ESNW should review the final design to verify that our geotechnical recommendations have been incorporated into the plans.

Surface

The subject site is located south of South 47th Street on Smithers Avenue South in Renton, Washington, as illustrated on the Vicinity Map (Plate 1). The site is approximately square in shape and consists of mostly undeveloped wooded land, with a paved temporary cul-de-sac at the north end of the site. A wetland tract is mapped at the east and southeast portions of the site. The topography of the site is slightly undulating with an overall ascending slope to the east, with a steep descending slope at the west side of the site. The Test Pit Location Plan (Plate 2) illustrates the approximate limits of the property and approximate existing topography.

Slope Reconnaissance

During our fieldwork, we performed a visual slope reconnaissance across portions of the steep slope areas of the site. The main focus of our reconnaissance was to identify signs of instability or erosion hazards along the site slopes. The typical instability indicators include such features as; head scarps, tension cracks, hummocky terrain, groundwater seeps along the surface and erosion features such as gulleys and rills. During the slope reconnaissance, no signs of recent, large scale erosion or slope instability were observed. In general, based on the slope reconnaissance, stability of the slope areas of the property can be characterized as good.

Seismic Considerations

The 2006 International Building Code (IBC) specifies several soil profiles that are used as a basis for seismic design of structures. Based on the soil conditions observed at the site, Site Class C from Table 1613.5.2 should be used for design.

In our opinion, the site is not susceptible to liquefaction. The soil relative density and the lack of an established shallow groundwater table is the primary basis for this opinion.

Slab-On-Grade Floors

Slab-on-grade floors should be supported on a firm and unyielding subgrade consisting of competent native soil or at least 12 inches of structural fill. Unstable or yielding areas of the subgrade should be recompacted or overexcavated and replaced with suitable structural fill prior to construction of the slab. A capillary break consisting of a minimum of four inches of free draining crushed rock or gravel should be placed below the slab. The free draining material should have a fines content of five percent or less (percent passing the #200 sieve, based on the minus three-quarters inch fraction). In areas where slab moisture is undesirable, installation of a vapor barrier below the slab should be considered. If used, the vapor barrier should consist of a material specifically designed to function as a vapor barrier and should be installed in accordance with the manufacturers specifications.

Retaining Walls

If retaining walls will be utilized, they should be designed to resist earth pressures and applicable surcharge loads. For design, the following parameters can be used for retaining wall design:

- Active earth pressure (yielding condition) — 35 pcf
- At-rest earth pressure (restrained condition) — 55 pcf
- Traffic surcharge (passenger vehicles) — 70 psf (rectangular distribution)
- Passive earth pressure — 300 pcf
- Coefficient of friction — 0.40

Drainage should be provided behind retaining walls such that hydrostatic pressures do not develop. If drainage is not provided, hydrostatic pressures should be included in the wall design.

Retaining walls should be backfilled with free draining material that extends along the height of the wall, and a distance of at least 18 inches behind the wall. The upper one foot of the wall backfill can consist of a less permeable (surface seal) soil, if desired. A perforated drain pipe should be placed along the base of the wall, and should be connected to an approved discharge location. A typical retaining wall drainage detail is provided on Plate 3 of this report.

Drainage

Groundwater seepage was observed at one test pit location at a depth of six to nine feet below grade during our fieldwork (February 2013). Perched groundwater seepage should be expected in site or utility excavations. Temporary measures to control groundwater seepage and surface water runoff during construction will likely involve interceptor trenches and sumps, as necessary.

In our opinion, perimeter footing drains should be installed at or below the invert of the building footings. A typical footing drain detail is provided on Plate 4 of this report.

Preliminary Infiltration Evaluation

As part of this geotechnical engineering study, the 2009 King County Surface Water Design Manual (KCSWDM) was reviewed. The City of Renton recognizes an amended version of the 2009 KCSWDM as the governing code.

At test pit TP-1, near the proposed residential lots 17, 18 and 19, poorly graded sand was observed to a depth of five feet where an increasing amount of gravel and silt was observed, as detailed in Appendices A and B of this report. In our opinion, for preliminary design purposes, an infiltration rate of four inches per hour may be achievable at these locations. ESNW can perform in-situ infiltration analyses upon request if infiltration will be pursued.

Based on the soils observed throughout the remainder of the site, as discussed in the *Subsurface* section of this report, adequate infiltration will not be achievable. Dispersion methods per section C.2.4 of the KCSWDM may be utilized where slopes less than 15 percent are present.

Utility Trench Backfill

In our opinion, the soils observed at the test sites are generally suitable for support of utilities. In general, the soils observed at the test pit locations should be suitable for use as structural backfill in the utility trench excavations, provided the soil is at or near the optimum moisture content at the time of placement and compaction. Moisture conditioning of the soils may be necessary at some locations prior to use as structural fill. Utility trench backfill should be placed and compacted to the specifications of structural fill provided in this report, or to the applicable requirements of the city of Renton.

Pavement Sections

The performance of site pavements is largely related to the condition of the underlying subgrade. To ensure adequate pavement performance, the subgrade should be in a firm and unyielding condition when subjected to proofrolling with a loaded dump truck. Structural fill in pavement areas should be compacted to the specifications detailed in the *Site Preparation and Earthwork* section of this report. It is possible that soft, wet, or otherwise unsuitable subgrade areas may still exist after base grading activities. Areas containing unsuitable or yielding subgrade conditions may require remedial measures such as overexcavation and thicker crushed rock or structural fill sections prior to pavement. Cement treatment of the subgrade soil can also be considered for stabilizing pavement subgrade areas.

Heavier truck-traffic areas generally require thicker pavement sections depending on site usage, pavement life expectancy, and site traffic. For preliminary design purposes, the following pavement sections for heavy traffic areas can be considered:

- Three inches of hot mix asphalt (HMA) placed over six inches of crushed rock base (CRB), or;
- Three inches of HMA placed over four and one-half inches of asphalt treated base (ATB).

For relatively lightly loaded pavements subjected to automobiles and occasional truck traffic, the following sections can be considered:

- Two inches of HMA placed over four inches of CRB, or;
- Two inches of HMA placed over three inches of ATB.

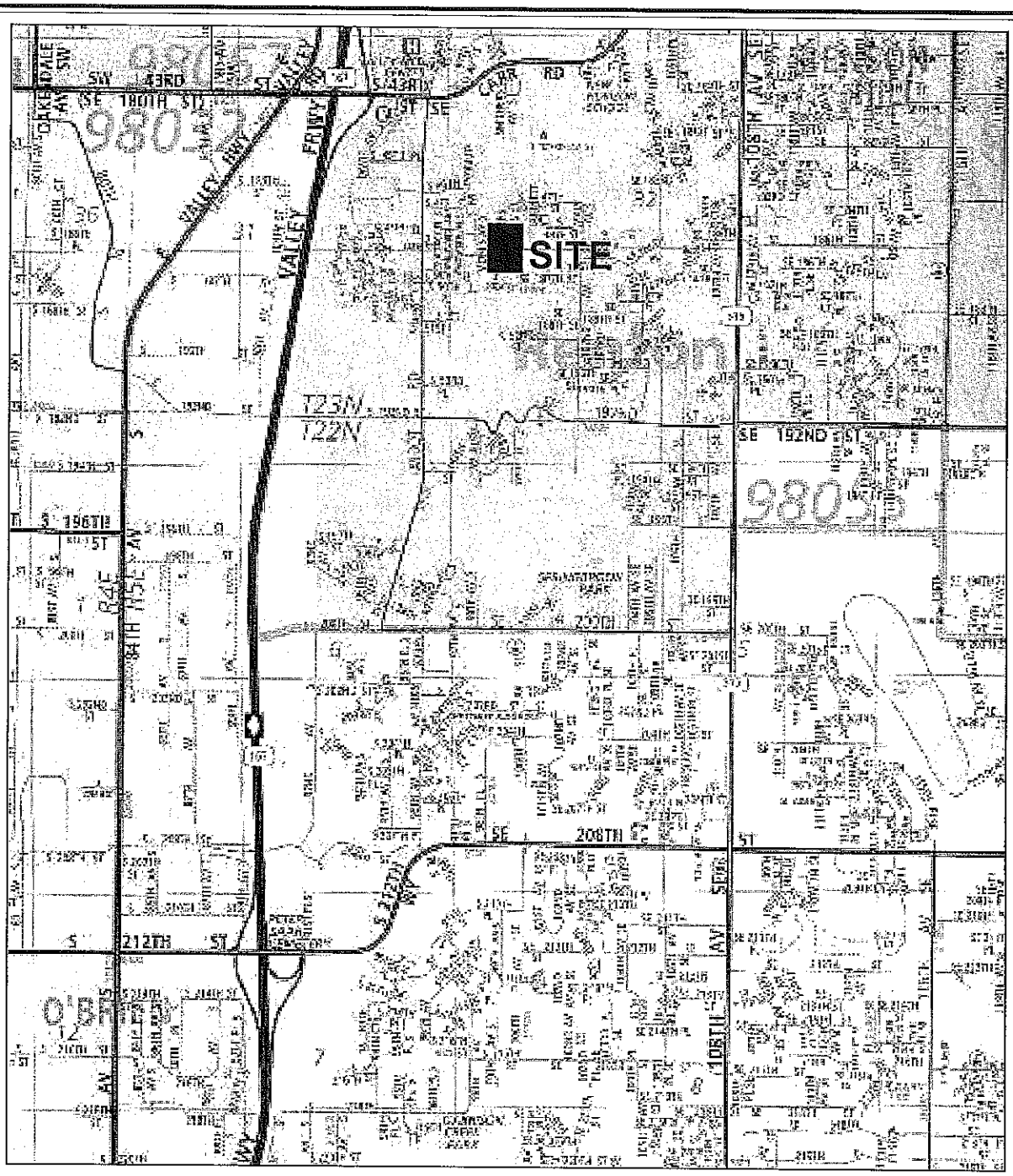
The HMA, ATB and CRB materials should conform to WSDOT specifications.

LIMITATIONS

The recommendations and conclusions provided in this geotechnical engineering study are professional opinions consistent with the level of care and skill that is typical of other members in the profession currently practicing under similar conditions in this area. A warranty is not expressed or implied. Variations in the soil and groundwater conditions observed at the test pit locations may exist, and may not become evident until construction. ESNW should reevaluate the conclusions in this geotechnical engineering study if variations are encountered.

Additional Services

ESNW should have an opportunity to review the final design with respect to the geotechnical recommendations provided in this report. ESNW should also be retained to provide testing and consultation services during construction.



NORTH

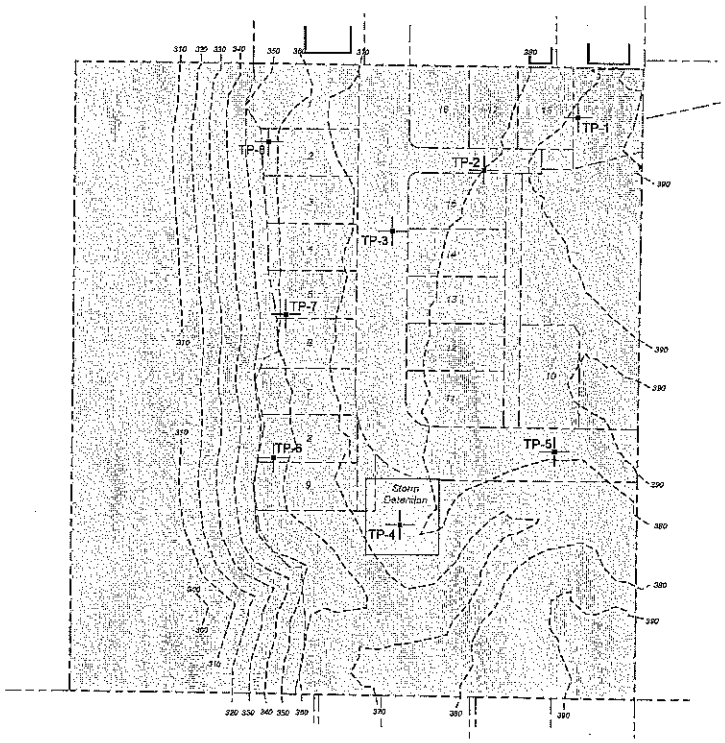
Reference:
King County, Washington
Map 686
By The Thomas Guide
Rand McNally
32nd Edition

NOTE: This plate may contain areas of color. ESNW cannot be responsible for any subsequent misinterpretation of the information resulting from black & white reproductions of this plate.

Earth Solutions NW LLC
Geotechnical Engineering, Construction Monitoring and Environmental Sciences

Vicinity Map
Smithers Avenue South Development
Renton, Washington

Drwn. GLS	Date 02/15/2013	Proj. No. 2660
Checked HTW	Date Feb. 2013	Plate 1



NORTH

1"=100' 0 50 100 200 Scale in Feet

LEGEND

TP-1 — Approximate Location of ESNW Test Pit, Proj. No. ES-2660, Feb. 2013

Subject Site

10 Proposed Lot Number

Existing Building

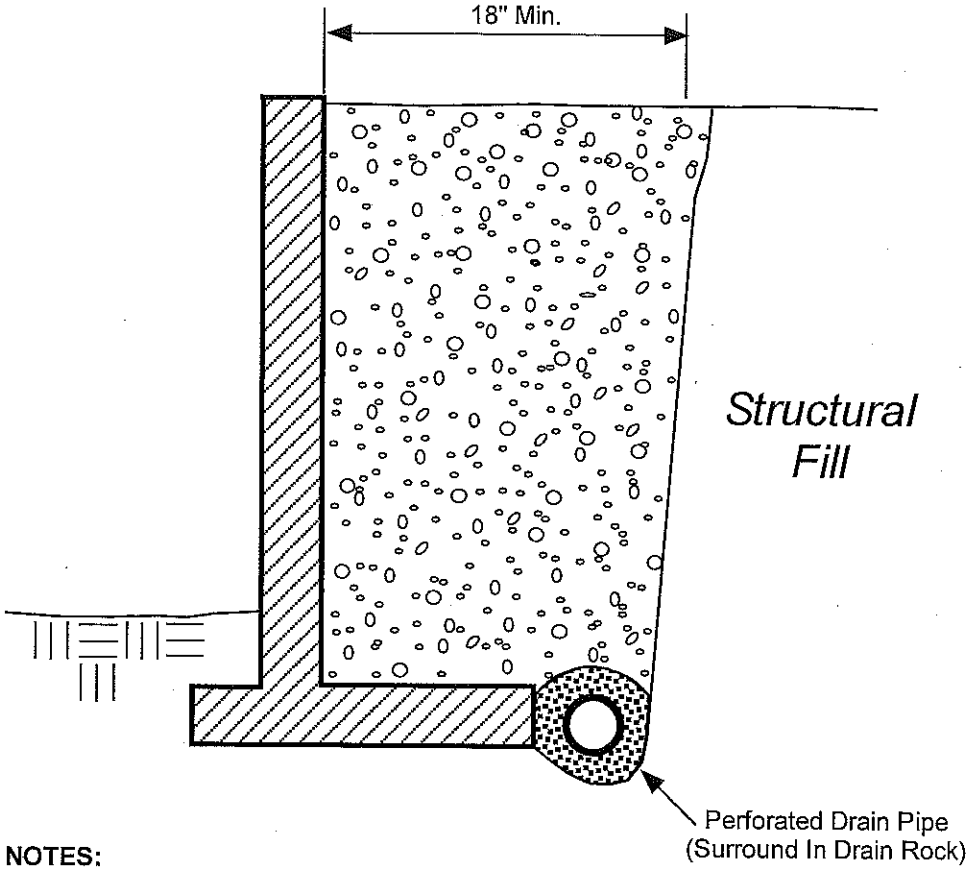
NOTE: The graphics shown on this plate are not intended for design purposes or precise scale measurements, but only to illustrate the approximate test locations relative to the approximate locations of existing and / or proposed site features. The information illustrated is largely based on data provided by the client at the time of our study. ESNW cannot be responsible for subsequent design changes or interpretation of the data by others.

NOTE: This plate may contain areas of color. ESNW cannot be responsible for any subsequent misinterpretation of the information resulting from black & white reproductions of this plate.

Test Pit Location Plan
Smithers Avenue South Development
Renton, Washington

Earth Solutions NW LLC
Engineering Construction Monitoring
Environmental Science

Drwn. By	GLS
Checked By	HTW
Date	02/18/2013
Proj. No.	2660
Plate	2



NOTES:

- Free Draining Backfill should consist of soil having less than 5 percent fines. Percent passing #4 should be 25 to 75 percent.
- Sheet Drain may be feasible in lieu of Free Draining Backfill, per ESNW recommendations.
- Drain Pipe should consist of perforated, rigid PVC Pipe surrounded with 1" Drain Rock.

SCHEMATIC ONLY - NOT TO SCALE
NOT A CONSTRUCTION DRAWING

LEGEND:

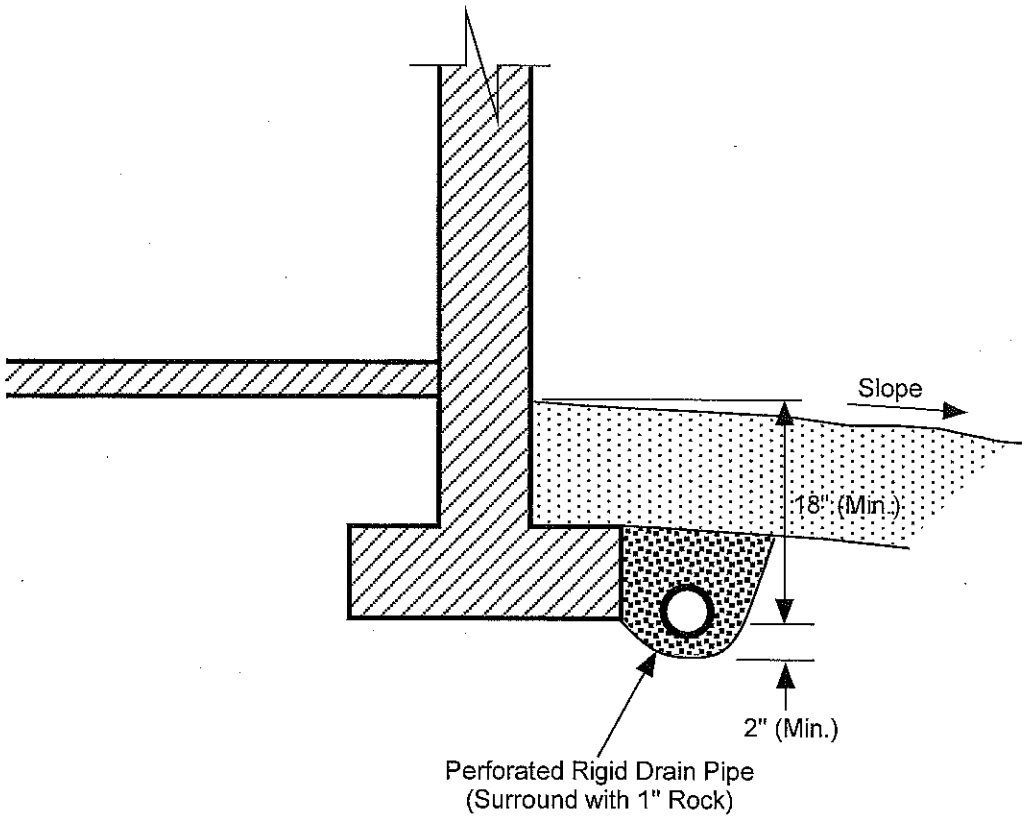
Free Draining Structural Backfill

1 inch Drain Rock

Earth Solutions NW LLC
Geotechnical Engineering, Construction Monitoring and Environmental Sciences

RETAINING WALL DRAINAGE DETAIL
Smithers Avenue South Development
Renton, Washington

Drwn. GLS	Date 02/19/2013	Proj. No. 2660
Checked HTW	Date Feb. 2013	Plate 3



NOTES:

- Do NOT tie roof downspouts to Footing Drain.
- Surface Seal to consist of 12" of less permeable, suitable soil. Slope away from building.

SCHEMATIC ONLY - NOT OT SCALE
NOT A CONSTRUCTION DRAWING

LEGEND:

Surface Seal; native soil or other low permeability material.

1" Drain Rock

Earth Solutions NW LLC
Geotechnical Engineering, Construction Monitoring and Environmental Sciences

FOOTING DRAIN DETAIL
Smithers Avenue South Development
Renton, Washington

Drwn. GLS	Date 02/19/2013	Proj. No. 2660
Checked HTW	Date Feb. 2013	Plate 4

APPENDIX A

SUBSURFACE EXPLORATION

ES-2660

The subsurface conditions at the site were explored by excavating eight test pits at the approximate locations illustrated on Plate 2 of this report. The test pit logs are provided in this Appendix. The subsurface explorations were completed in February 2013. The test pits were advanced to a maximum depth of 12 feet below existing grades.

Logs of the test pits advanced by ESNW are presented in Appendix A. The final logs represent the interpretations of the field logs and the results of laboratory analyses. The stratification lines on the logs represent the approximate boundaries between soil types. In actuality, the transitions may be more gradual.

Earth Solutions NW LLC

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

DUAL SYMBOLS are used to indicate borderline soil classifications.

The discussion in the text of this report is necessary for a proper understanding of the nature of the material presented in the attached logs.

Earth Solutions NW
1805 136th Place N.E., Suite 201
Bellevue, Washington 98005
Telephone: 425-284-3300

TEST PIT NUMBER TP-1

CLIENT Harbour Homes
PROJECT NAME Smithers Avenue South Development
PROJECT NUMBER 2660
PROJECT LOCATION Renton, Washington
DATE STARTED 2/8/13 **COMPLETED** 2/8/13
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR NW Excavating
GROUND WATER LEVELS:
EXCAVATION METHOD _____
AT TIME OF EXCAVATION ---
LOGGED BY HTW **CHECKED BY** HTW
AT END OF EXCAVATION ---
NOTES Depth of Topsoil & Sod 3"- 4"
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0					Brown poorly graded SAND, medium dense, moist
		MC = 21.20%	SP		-increasing medium to coarse sand
					-becomes gray, dense, moist to wet
5		MC = 9.70%			5.0
			SP-SM		Becomes brown SAND and GRAVEL with silt, dense, moist
					-becomes very dense, wet
		MC = 9.30%			8.0
			SM		Becomes brown gray silty SAND with gravel and cobbles, very dense, wet
10		MC = 19.50%			10.0
					Test pit terminated at 10.0 feet below existing grade. Groundwater seepage encountered at 6.0 feet during excavation.
					Bottom of test pit at 10.0 feet.

Earth Solutions NW
1805 136th Place N.E., Suite 201
Bellevue, Washington 98005
Telephone: 425-284-3300

TEST PIT NUMBER TP-2

CLIENT Harbour Homes
PROJECT NAME Smithers Avenue South Development
PROJECT NUMBER 2660
PROJECT LOCATION Renton, Washington
DATE STARTED 2/8/13 COMPLETED 2/8/13
GROUND ELEVATION ___ TEST PIT SIZE ___
EXCAVATION CONTRACTOR NW Excavating
GROUND WATER LEVELS:
EXCAVATION METHOD ___
AT TIME OF EXCAVATION ---
LOGGED BY HTW CHECKED BY HTW
AT END OF EXCAVATION ---
NOTES Depth of Topsoil & Sod 3"- 4"
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0					Brown silty SAND, medium dense, moist
		MC = 8.40%	SM		
5		MC = 11.10%			5.0 Becomes gray silty SAND with gravel, dense, moist
			SM		-becomes very dense
10		MC = 18.80%			10.0 Test pit terminated at 10.0 feet below existing grade. No groundwater encountered during excavation. Bottom of test pit at 10.0 feet.

GENERAL BH / TP / WELL 2660.GPJ GINTUS.GDT 2/19/13

Earth Solutions NW
1805 136th Place N.E., Suite 201
Bellevue, Washington 98005
Telephone: 425-284-3300

TEST PIT NUMBER TP-3

CLIENT Harbour Homes
PROJECT NAME Smithers Avenue South Development
PROJECT NUMBER 2660
PROJECT LOCATION Renton, Washington
DATE STARTED 2/8/13 **COMPLETED** 2/8/13
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR NW Excavating
GROUND WATER LEVELS:
EXCAVATION METHOD _____
AT TIME OF EXCAVATION —
LOGGED BY HTW **CHECKED BY** HTW
AT END OF EXCAVATION —
NOTES Depth of Topsoil & Sod 3"- 4"
AFTER EXCAVATION —

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0					Brown silty SAND, medium dense, moist
		MC = 27.00%			-becomes dense to very dense, moist to wet
					-increasing fine sands
5			SM		-becomes gray
		MC = 19.10%			
		MC = 16.10%			
9.0					Test pit terminated at 9.0 feet below existing grade. No groundwater encountered during excavation.
					Bottom of test pit at 9.0 feet.

Earth Solutions NW
1805 136th Place N.E., Suite 201
Bellevue, Washington 98005
Telephone: 425-284-3300

TEST PIT NUMBER TP-4

CLIENT Harbour Homes
PROJECT NAME Smithers Avenue South Development
PROJECT NUMBER 2660
PROJECT LOCATION Renton, Washington
DATE STARTED 2/8/13 **COMPLETED** 2/8/13
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR NW Excavating
GROUND WATER LEVELS:
EXCAVATION METHOD _____
AT TIME OF EXCAVATION ---
LOGGED BY HTW **CHECKED BY** HTW
AT END OF EXCAVATION ---
NOTES Depth of Topsoil & Sod 3"- 4"
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0					Brown silty SAND with gravel, medium dense to dense, moist
					-becomes dense to very dense
		MC = 12.20%			
5					-becomes gray, very dense
		MC = 9.40%	SM		
10					
		MC = 9.60%			
				12.0	Test pit terminated at 12.0 feet below existing grade. No groundwater encountered during excavation.
					Bottom of test pit at 12.0 feet.

Earth Solutions NW
1805 136th Place N.E., Suite 201
Bellevue, Washington 98005
Telephone: 425-284-3300

TEST PIT NUMBER TP-5

CLIENT Harbour Homes
PROJECT NAME Smithers Avenue South Development
PROJECT NUMBER 2660
PROJECT LOCATION Renton, Washington
DATE STARTED 2/8/13 **COMPLETED** 2/8/13
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR NW Excavating
GROUND WATER LEVELS:
EXCAVATION METHOD _____
AT TIME OF EXCAVATION —
LOGGED BY HTW **CHECKED BY** HTW
AT END OF EXCAVATION —
NOTES Depth of Topsoil & Sod 5"
AFTER EXCAVATION —

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			SM		Brown silty SAND, medium dense, moist
2.0					Gray silty SAND with gravel, dense to very dense, moist
		MC = 16.10%			
5			SM		
		MC = 11.10%			
		MC = 8.00%			
8.0					Test pit terminated at 8.0 feet below existing grade. No groundwater encountered during excavation.
					Bottom of test pit at 8.0 feet.

Earth Solutions NW
1805 136th Place N.E., Suite 201
Bellevue, Washington 98005
Telephone: 425-284-3300

TEST PIT NUMBER TP-6

CLIENT Harbour Homes
PROJECT NAME Smithers Avenue South Development
PROJECT NUMBER 2660
PROJECT LOCATION Renton, Washington
DATE STARTED 2/8/13 **COMPLETED** 2/8/13
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR NW Excavating
GROUND WATER LEVELS:
EXCAVATION METHOD _____
AT TIME OF EXCAVATION ---
LOGGED BY HTW **CHECKED BY** HTW
AT END OF EXCAVATION ---
NOTES Depth of Topsoil & Sod 6"
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0					Brown sandy SILT, medium stiff, wet
		MC = 28.90%	ML		-increasing fine sands
					-intermittent gray
					4.0 Becomes brown sandy SILT, stiff, moist to wet
5		MC = 29.00%			
			ML		-increasing medium sands
		MC = 15.00%			-becomes hard, moist
					9.0 Test pit terminated at 9.0 feet below existing grade. No groundwater encountered during excavation.
					Bottom of test pit at 9.0 feet.

Earth Solutions NW
1805 136th Place N.E., Suite 201
Bellevue, Washington 98005
Telephone: 425-284-3300

TEST PIT NUMBER TP-7

CLIENT Harbour Homes
PROJECT NAME Smithers Avenue South Development
PROJECT NUMBER 2660
PROJECT LOCATION Renton, Washington
DATE STARTED 2/8/13 **COMPLETED** 2/8/13
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR NW Excavating
GROUND WATER LEVELS:
EXCAVATION METHOD _____
AT TIME OF EXCAVATION ---
LOGGED BY HTW **CHECKED BY** HTW
AT END OF EXCAVATION ---
NOTES Depth of Topsoil & Sod 3"- 4"
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			SM		Brown silty SAND, medium dense to dense, moist to wet
					-increasing fines
		MC = 30.70%	ML		Brown sandy SILT, stiff, moist
5					-intermittent gray
		MC = 27.80%	ML		Becomes brown gray sandy SILT, hard, wet
10					-becomes very dense
		MC = 31.20%			-becomes gray
					Test pit terminated at 12.0 feet below existing grade. No groundwater encountered during excavation.
					Bottom of test pit at 12.0 feet.

Earth Solutions NW
1805 136th Place N.E., Suite 201
Bellevue, Washington 98005
Telephone: 425-284-3300

TEST PIT NUMBER TP-8

CLIENT Harbour Homes
PROJECT NAME Smithers Avenue South Development
PROJECT NUMBER 2660
PROJECT LOCATION Renton, Washington
DATE STARTED 2/8/13 **COMPLETED** 2/8/13
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR NW Excavating
GROUND WATER LEVELS:
EXCAVATION METHOD _____
AT TIME OF EXCAVATION ---
LOGGED BY HTW **CHECKED BY** HTW
AT END OF EXCAVATION ---
NOTES Depth of Topsoil & Sod 2"- 3"
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			SM		Brown silty SAND, medium dense to dense, moist
					-increasing fines
					2.5
		MC = 37.70%	ML		Brown sandy SILT, stiff to very stiff, wet
5					-trace gravel
		MC = 33.20%			-intermittent gray
					-becomes hard
					8.0
			SM		Gray silty SAND with gravel, very dense, moist
10					
		MC = 11.40%			11.0
					Test pit terminated at 11.0 feet below existing grade. No groundwater encountered during excavation.
					Bottom of test pit at 11.0 feet.

GENERAL BH / TP / WELL 2660.GPJ GINT US.GDT 2/19/13

APPENDIX B

LABORATORY TEST RESULTS

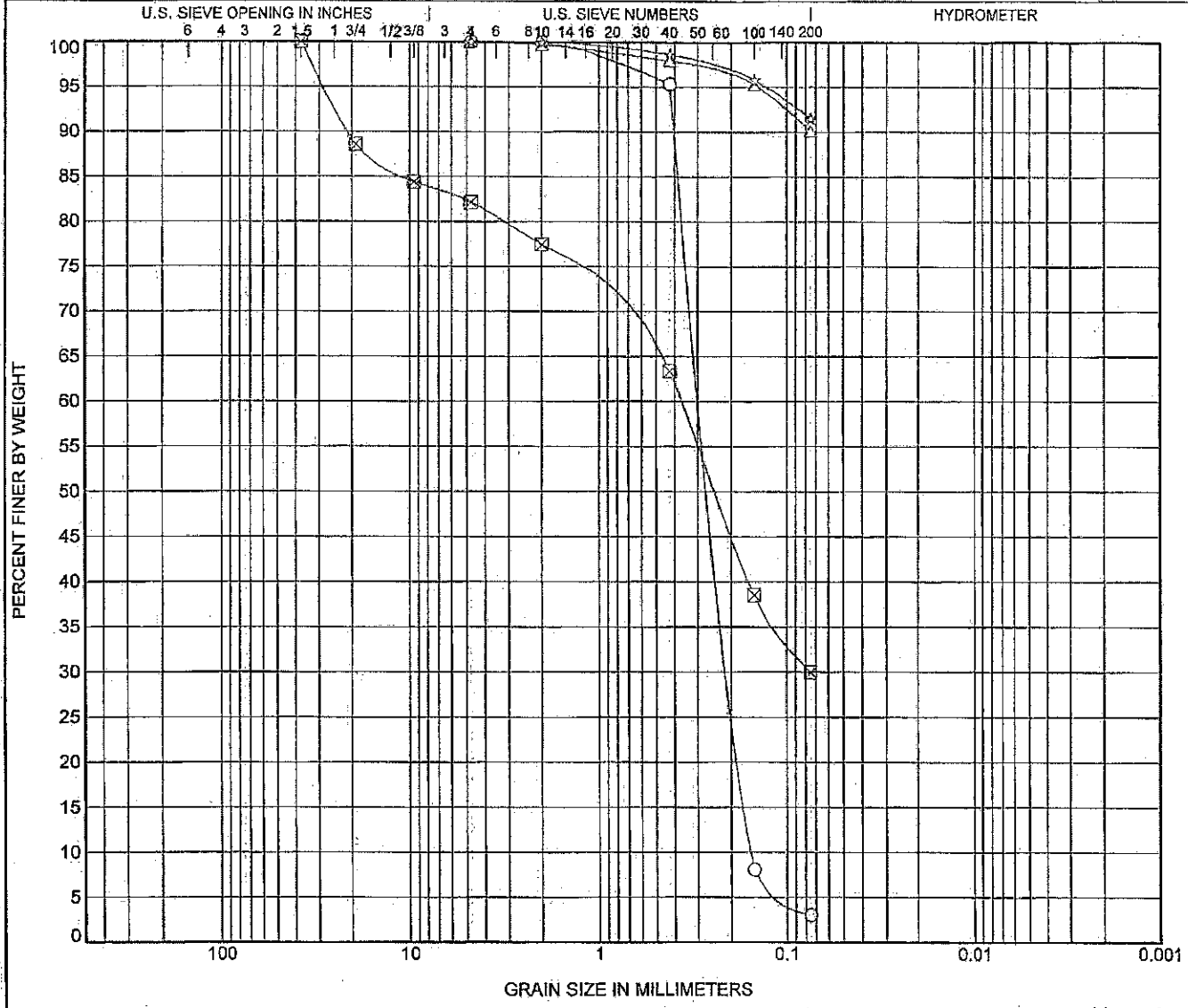
ES-2660

Earth Solutions NW
1805 - 136th Place N.E., Suite 201
Bellevue, WA 98005
Telephone: 425-284-3300

GRAIN SIZE DISTRIBUTION

CLIENT Geonerco Properties WA, LLC **PROJECT NAME** Smithers Ave

PROJECT NUMBER ES-2660 **PROJECT LOCATION** Renton



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
○	TP-1	3.0ft.	Brown poorly graded SAND, SP				0.89	1.82
⊠	TP-4	6.0ft.	Gray silty SAND with gravel, SM					
△	TP-6	5.0ft.	Brown SILT, ML					
☆	TP-8	6.0ft.	Brown SILT, ML					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
○	TP-1	3.0ft.	4.75	0.279	0.195	0.154	0.0	97.0	3.0	
⊠	TP-4	6.0ft.	37.5	0.37	0.075		17.9	52.2	30.0	
△	TP-6	5.0ft.	4.75				0.0	9.9	90.1	
☆	TP-8	6.0ft.	4.75				0.0	8.5	91.5	

REPORT DISTRIBUTION

ES-2660

EMAIL ONLY

Geonerco Properties, LLC
1441 North 34th Street, #200
Seattle, Washington 98103

Attention: Mr. Jamie Waltier

SITE STRUCTURES
A Division of Kosnik Engineering, PC

Vuecrest Estates
Storm Water Detention Vault

Renton, Washington

Structural Calculations

Project No. S-14-045

First Issue 07-07-14

EXHIBIT 28

10511 19TH Ave SE, Suite C, Everett, WA 98208 ◆ (425) 357-9600 (phone) ◆ e-mail: dan@kosnik.com

Vuecrest Estates
Storm Water Detention Vault

Project No. S-14-045

STRUCTURAL CALCULATIONS INDEX

SHEET 1
7/7/14
S-14-045

Vuecrest Estates
Storm Water Detention Vault

DESIGN CRITERIA

Code:	2012 IBC
Permitting Agency:	City of Renton
Soil Cover:	18" over the entire vault
Lid Loading:	HS20-44 truck loading 150 psf uniform live load Uniform live load not to act concurrently with truck wheel loading.
Grating:	100psf pedestrian loading on raised grate

Foundation Design:

Foundation design is based on the following values provided by Earth Solutions NW

Allowable Bearing Pressure: 4,000 psf

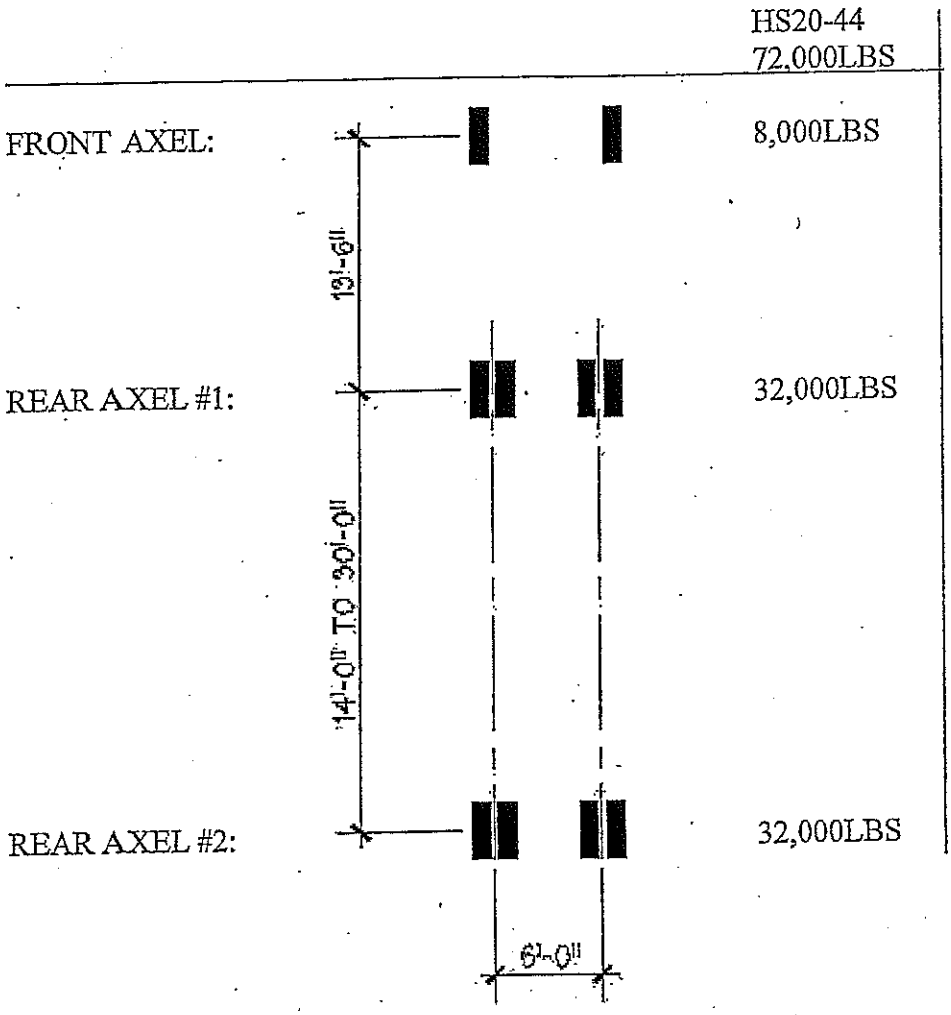
Soil Design Values:

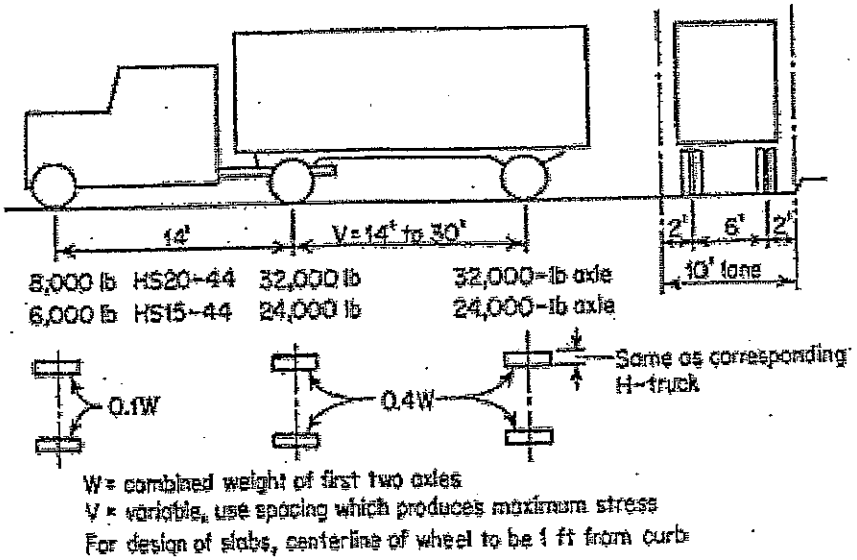
At Rest Pressure:	55 pcf EFW (Drained Level Backfill)
Active Pressure:	35 pcf EFW (Drained Level Backfill)
Seismic Addition:	E = 10H psf Uniform

Saturated Soil Density: 125 pcf

Material Requirements:

Rebar:	Grade 60
Concrete:	f'c= 4000 psi walls and lid, f'c=3000psi ftgs & grade slab
Lid:	Pre-cast, Pre-stressed Hollow Core Plank 12-1/2" thick.

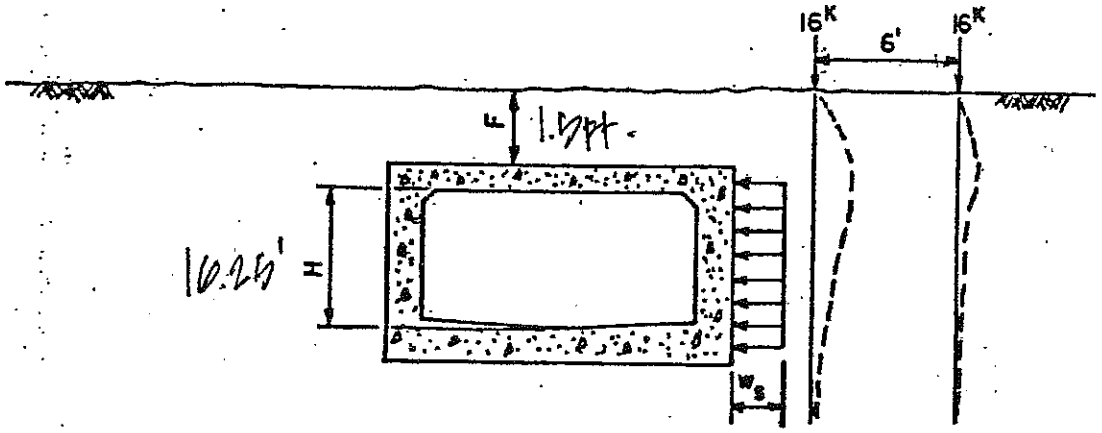


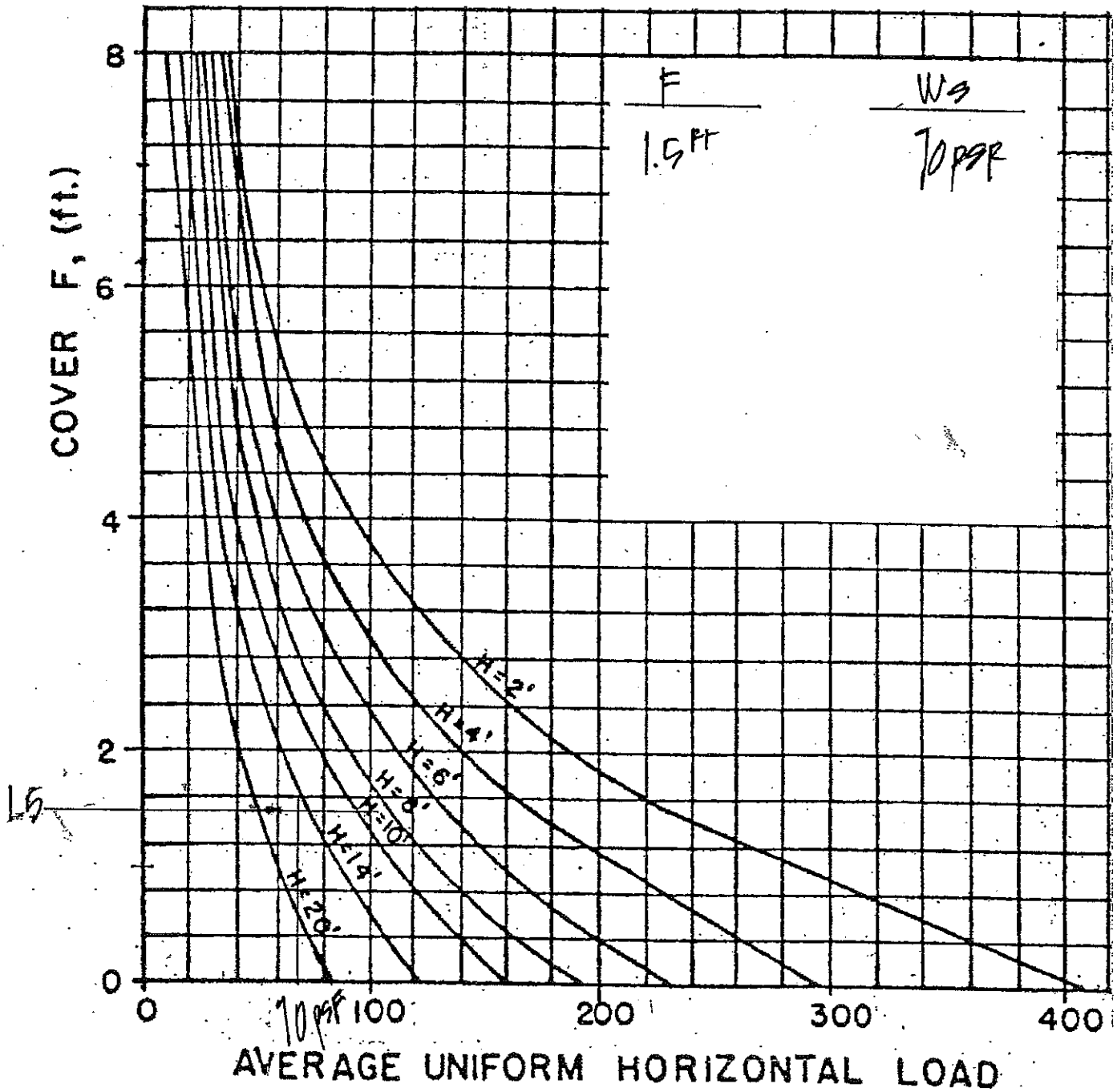


W = combined weight of first two axles
V = variable, use spacing which produces maximum stress
For design of slabs, centerline of wheel to be 1 ft from curb

5
7/7/14
S-14-045

HS20-44 TRUCK LIVE LOAD ON WALLS





SITE STRUCTURES
10511 19th Ave SE, Suite C
Everett, WA, (425)-357-9600

Project Vuecrest Estates

sheet 4
date 7/7/14
prj. no. S-14-045

PRECAST HOLLOW CORE PLANK REVIEW

Lid Data

Soil Desity	125	pcf
Soil Cover depth over lid	1.5	ft
Plank design clear span	23	ft
Design Uniform Live Load	150	psf
Design Superimposed Load	337.5	psf

Plank capacity based on uniform superimposed load tables

Plank span	28	ft
No of tendons	11	
Allowable superimposed loads	413	psf

Allowable superimposed loads base of design span of	23.25	ft
Based on flexural capacity	599	psf
Based on shear capacity	497	psf

Plank capacity based on truck load charts

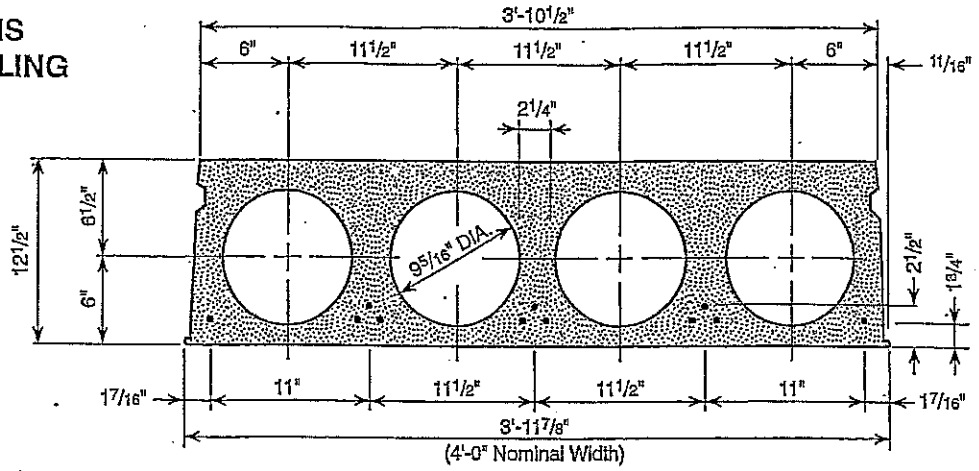
Plank span	23.25	ft
No of tendons	11	
Allowable soil cover without knee-walls	0.75 to 2.25	ft
Allowable soil cover with knee-walls	0.5 to 4.0	ft

KNEEWALLS NOT REQD

7/7/14
S-14-045

12½" HOLLOW CORE SLAB

DIMENSIONS FOR DETAILING



SPAN-LOAD TABLE

ALLOWABLE SUPERIMPOSED LOAD in pounds per square foot										
Effective Prestress (KIPS)	No. of 1/2" ø STRANDS	SIMPLE SPAN in feet								
		28	32	36	40	44	48	52	56	60
70.7	3	78	44	20						
77.7	4	126	80	49	26					
101.3	5	174	117	78	50	27				
124.8	6	221	153	106	70	43	23*			
148.4	7	267	186	129	89	59	36			
172.0	8	307	216	153	108	74	49	29		
195.5	9	343	243	174	125	89	61	40	23*	
219.1	10	378[1]	270	195	142	103	73	50	31*	
242.7	11	413[1]	297	217	160	117	85	60	40	24*

SECTION PROPERTIES (with shear keys grouted)

$A = 313\ in^2$ $Z_t = 1019\ in^3$ $Z_b = 947\ in^3$ $w = 84\ psf$

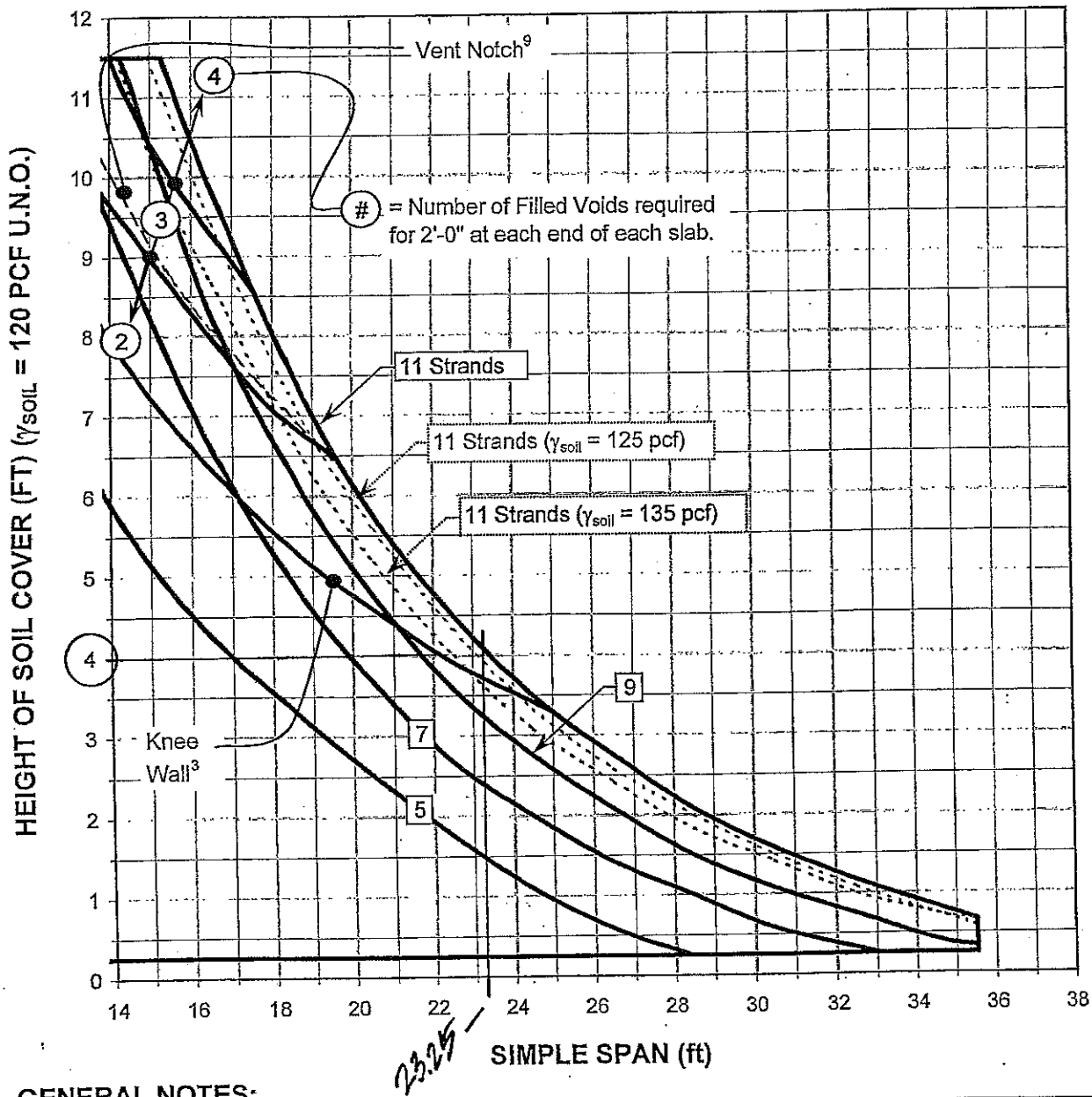
$I = 6136\ in^4$ $Y_t = 6.02\ in$ $Y_b = 6.48\ in$

NOTES:

1. The values given in this table are based on hollow core slabs without shear reinforcement. Superscripts (1, 2, etc.) following values in the table indicate the number of filled voids required at the ends of slabs to develop the allowable superimposed load. See page 2, "SHEAR" for discussion.
2. Asterisk (*) following values in the table indicate that the total deflection under all loads is greater than L/360 but less than L/180.
3. Interpolation between values is acceptable. Do not extrapolate values into the blank spaces of the table.
4. These Span-Load Tables are intended as an aid to preliminary sizing. Sound engineering judgement is required for the application of this information to specific design cases.

7/7/14
S-14-045

12½" HOLLOW CORE SLAB
150 PSF



23.25

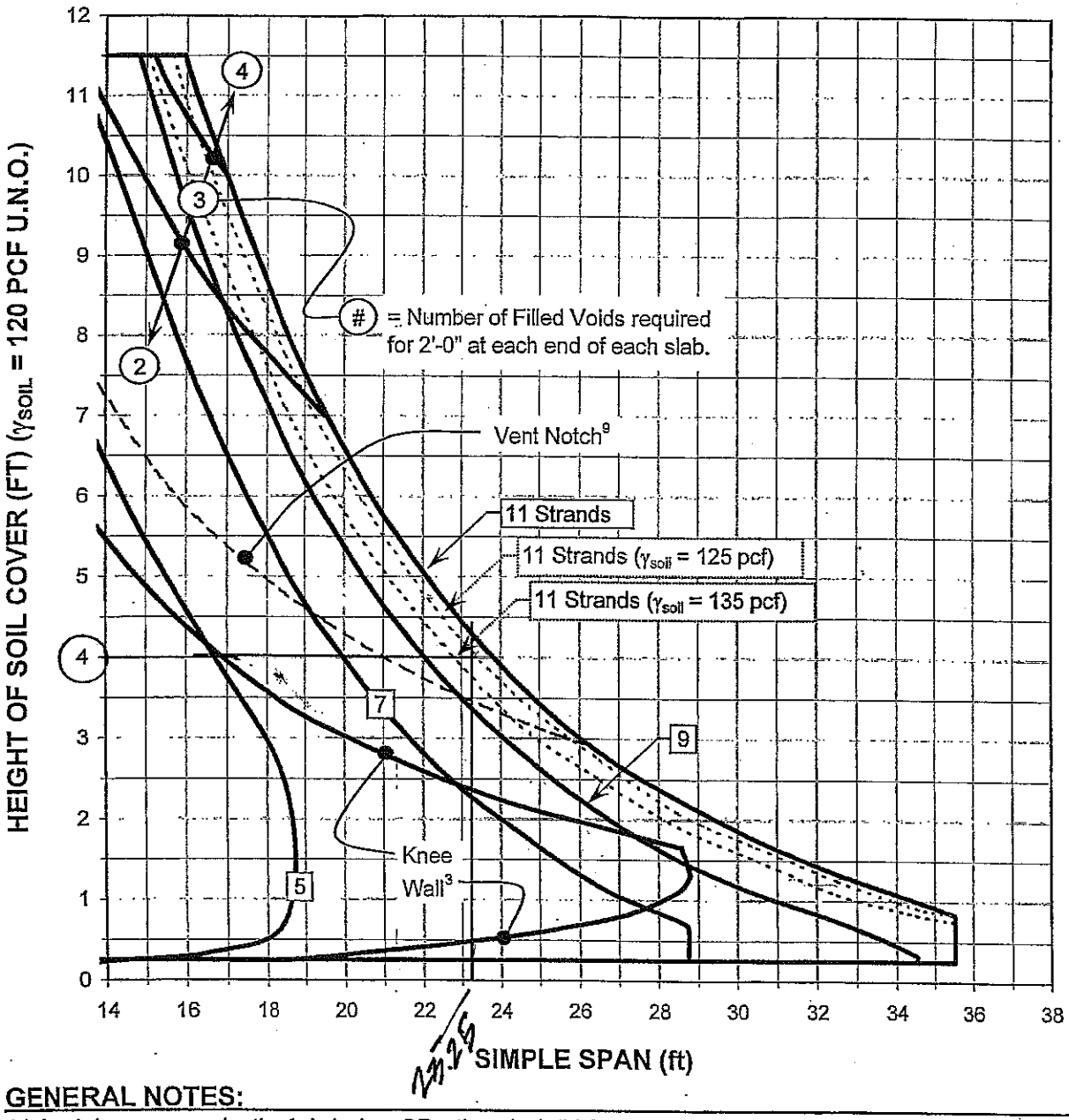
GENERAL NOTES:

1.) A minimum cover depth of six inches OR a three inch thick cast in place concrete topping slab is required.
2.) Simple Span is centerline of bearing to centerline of bearing.
3.) The Knee Wall envelope represents the maximum span and height of soil cover that can be supported by slabs with standard notches for manhole openings, assuming void fill concrete f'c = 3,000 psi. Points falling outside this envelope require knee walls to support the slabs at manhole openings.
4.) Interpolation between strand contours is acceptable. DO NOT extrapolate beyond the bounds of this chart.
5.) Soil cover is assumed to be uniform.
6.) Except as noted, soil cover unit weight is assumed to be 120 pcf.
7.) Minimum span length = 14'-0".
8.) The values shown on this chart are in compliance with IBC 2003 & ACI 318-05.
9.) The Vent Notch envelope represents the maximum span and height of soil cover that can be supported by slabs with 6½" standard notches in adjacent slabs to accommodate 12" diameter vents, assuming void fill concrete f'c = 3,000 psi. Refer to Detail 3 on page 15 of this brochure for vent notch details.

Sheet 1
7-7-14
S-14-045

CONCRETE TECHNOLOGY CORPORATION

12½" HOLLOW CORE SLAB
HS20-44



GENERAL NOTES:

1.) A minimum cover depth of six inches OR a three inch thick cast in place concrete topping slab is required.
2.) Simple Span is centerline of bearing to centerline of bearing.
3.) The Knee Wall envelope represents the maximum span and height of soil cover that can be supported by slabs with standard notches for manhole openings, assuming void fill concrete f'c = 3,000 psi. Points falling outside this envelope require knee walls to support the slabs at manhole openings.
4.) Interpolation between strand contours is acceptable. DO NOT extrapolate beyond the bounds of this chart.
5.) Soil cover is assumed to be uniform.
6.) Except as noted, soil cover unit weight is assumed to be 120 pcf.
7.) Minimum span length = 14'-0".
8.) The values shown on this chart are in compliance with IBC 2003 & ACI 318-05.
9.) The Vent Notch envelope represents the maximum span and height of soil cover that can be supported by slabs with 6½" standard notches in adjacent slabs to accommodate 12" diameter vents, assuming void fill concrete f'c = 3,000 psi. Refer to Detail 3 on page 15 of this brochure for vent notch details.

SITE STRUCTURES
10511 19th Ave SE, Suite C
Everett, WA, (425)-357-9600

Project Vuecrest Estates

sheet: 8
date: 7/7/14
prj. no. S-14-045

Vault Walls - Lateral Pressures Review

Minimum soil cover depth to top of wall:	2.5 ft
Maximum soil cover depth to top of wall:	2.5 ft
Wall Height:	16.25 ft
At-Rest soil pressure:	55 pcf EFD
Active soil pressure:	35 pcf EFD
Uniform Addition to At-Rest soil pressure:	0 psf
Soil Density:	125 pcf

Load Combinations:

1.6 L (soil pressure) + 1.6 L (surcharge/wheel load)
1.6 L (soil pressure) + 1.0 L (seismic)

Due to HS20 Truck Loading:

1.5 ft min cover over lid:	70 psf Uniform
1.5 ft max cover over lid:	70 psf Uniform

Total Factored Lateral Force:

1.5 ft min cover over lid:	17014 plf ——— CONTROLS DESIGN
1.5 ft max cover over lid:	17014 plf

Due to Uniform Surcharge Load:

Uniform surcharge:	150 psf
Equivalent lateral force:	66 psf Uniform

Total Factored Lateral Force:
1.5 ft max cover over lid: 16910 plf

Due to Seismic Activity:

Uniform seismic addition: E =	10 H
Seismic lateral force:	163 psf Uniform

Total Factored Lateral Force:
1.5 ft max cover over lid: 12309 plf
Combined Load Factor: 1.47

SITE STRUCTURES
10511 19th Ave SE, Suite C
Everett, WA, (425)-357-9600

Project Vuecrest Estates

sheet 9
date 7/7/14
prj. no. S-14-045

Design Data W/ TRAFFIC SURCHARGE

Soil Density	125 pcf		
Soil Cover depth to the top of the wall	2.5 ft	Ws1 =	137.5 psf
Wall height	16.25 ft	Ws2 =	893.75 psf
Soil Pressure EFW	55 pcf		

Surcharge Information

uniform S1 = 150 psf (on surface of ground) Equiv Ws = 66 psf
truck Ws = 70 psf (on surface of wall - see design chart)

Critical Design Surcharge pressure = 70 psf (on the surface of the wall)

Calculated Design Forces

W1= 207.5	F1 = 3371.875 lbs	R top =	4107 lbs
W2= 893.75	F2 = 7261.719 lbs	R bot =	6527 lbs

M1 = 6849 M total= **21989** ft-lbs
M2 = 15140

Wall Reinforcing

Wall thickness	12 inches	Comp block (a) =	1.39 inches
Clear cover	2 inches	Depth to CL bar (d) =	9.50 inches
Rebar size	8	d-a/2 =	8.81 inches
Rebar area	0.79 sq-in		
Bar spacing	10 inches	ΦMn =	**37351** ft-lbs
Rebar strength fy	60 ksi		
Conc strength f'c	4000 psi	Mu =	**26387** ft-lbs
Load Factor	1.2		

max tension reinforcing spacing: f_s = 31790 psi
s = 13.9 in
s = 15.1 in
s_{max} = **13.9** in - OK

Anchorage at Top of the Wall

Ru = **4928** plf
Shear capacity of Dowel = **11376** plf
Bearing capacity of Dowel = **5670** plf

Rebar Dowel Size =	8
Dowel Area =	0.79 sq-in
Dowel strength fy=	60 ksi
Dowel Spacing =	20 inches
Dowel brg length =	2.25 inches
conc strength f'c =	3000 psi

Anchorage at Bottom of the Wall

Ru = **7833** plf
Nominal Shear friction capacity of the footing to wall Dowel **11383** plf

Rebar Dowel Size =	5
Dowel Area =	0.31 sq-in
Dowel strength fy=	60 ksi
Dowel Spacing =	10 inches
Coefficient of friction =	0.6 smooth surface

SITE STRUCTURES
10511 19th Ave SE, Suite C
Everett, WA, (425)-357-9600

Project Vuecrest Estates

sheet 10
date 7/7/14
prj. no. S-14-045

Design Data

W/O TRAFFIC SURCHARGES

Soil Density	125 pcf		
Soil Cover depth to the top of the wall	2.5 ft	Ws1 =	137.5 psf
Wall height	16.25 ft	Ws2 =	893.75 psf
Soil Pressure EFW	55 pcf		

Surcharge Information

uniform S1 = 150 psf (on surface of ground) Equiv Ws = 66 psf
truck Ws = 70 psf (on surface of wall - see design chart)

Critical Design Surcharge pressure = 0 psf (on the surface of the wall)

Calculated Design Forces

W1= 137.5
W2= 893.75

F1 = 2234.375 lbs
F2 = 7261.719 lbs

R top = 3538 lbs
R bot = 5958 lbs

M1 = 4539
M2 = 15140

M total= **19678** ft-lbs

Wall Reinforcing

Wall thickness	12 inches	Comp block (a) =	1.39 inches
Clear cover	2 inches	Depth to CL bar (d) =	9.50 inches
Rebar size	8	d-a/2 =	8.81 inches
Rebar area	0.79 sq-in		
Bar spacing	10 inches	ΦMn =	**37351** ft-lbs
Rebar strength fy	60 ksi		
Conc strength f'c	4000 psi	Mu =	**23614** ft-lbs
Load Factor	1.2		

max tension reinforcing spacing: f_s = 28450 psi

s = 16.1 in
s = 16.9 in
s_{max} = **16.1** in - OK

Anchorage at Top of the Wall

Ru = **4245** plf

Shear capacity of Dowel = **11376** plf
Bearing capacity of Dowel = **5670** plf

Rebar Dowel Size =	8
Dowel Area =	0.79 sq-in
Dowel strength fy=	60 ksi
Dowel Spacing =	20 inches
Dowel brg length =	2.25 inches
conc strength f'c =	3000 psi

Anchorage at Bottom of the Wall

Ru = **7150** plf

Nominal Shear friction capacity of the footing to wall Dowel **11383** plf

Rebar Dowel Size =	5
Dowel Area =	0.31 sq-in
Dowel strength fy=	60 ksi
Dowel Spacing =	10 inches
Coefficient of friction =	0.6 smooth surface

SITE STRUCTURES
10511 19th Ave SE, Suite C
Everett, WA, (425)-357-9600

Project Vuecrest Estates

sheet 11
date 7/7/14
prj. no. S-14-045

INTERIOR WALL HEADER GEOMETRY AND LOADS ANALYSIS

Header Overburden & Uniform Loads

Lid weight	125	psf	
Soil Desity	125	pcf	Load Factors
Soil Cover depth over lid	1.5	ft	LL 1.6
Plank design clear span left	23	ft	DL 1.2
Plank design clear span right	23	ft	
Design Uniform Live Load	150	psf	

Lid tributary width to header	23	ft
Uniform service load to header	10638	plf
Uniform factored load to header	14145	plf

Truck Wheel Loads to Header

Truck type	HS-20	
Axle Load	32000	lbs
Wheel Spacing	6	ft
Cover depth	1.5	ft

Axle assumed centered over & perpendicular to header

distribution width	3.50 ft	opening width	10.00 ft
distribution length	10.00 ft	length ea side of hdr	5.00 ft

uniform load @ top of plank	914	psf
wheel load to header from left span	4075	plf
wheel load to header from right span	4075	plf
Total wheel load to header	8149	plf
Factored wheel load to header	13039	plf

Design Loads & Forces in Header

Service	18.8	klf
Factored	27.2	klf

Critical section for shear is at 1.5 feet from the face of the support

Design Vu =	95	k
Design Mu =	340	k-ft

SITE STRUCTURES
10511 19th Ave SE, Suite C
Everett, WA, (425)-357-9600

Project Vuecrest Estates

sheet 12
date 7/7/14
prj. no. S-14-045

INTERIOR WALL HEADER DESIGN

Header Data

Header width	8 inches	Concrete Strength	4000 psi
Header span	10.00 ft		
Header depth	63 inches	d =	60.00 inches
ln/d ratio	2.00	Deep Beam limit ln/d < 5.0	

Min shear steel (Area / spacing) ratio	0.012	Min Rebar spacing	
Max spacing of shear steel	12.6 inches	# 3 @	9.17
		# 4 @	16.67
Min horiz steel (Area / spacing) ratio	0.02	# 4 @	10.00
Max spacing of horzontal steel	21 inches	# 5 @	15.50

Review shear capacity of header

Reinforcing yield strength	60 ksi		
Shear reinforcing area	0.31 sq in	Horz reinf area	0.31 sq in
spacing	12 in	Horz reinf spacing	12 in
Reinf shear capacity ΦVs	83 k	Conc shear capacity ΦVc	52 k
Total Shear Capacity	135 k	Factored shear Vu	95 k
Max ΦVn @ ln/d < 2	206 k		
Max ΦVn @ 2 < ln/d < 5	21784 k		

Review flexural capacity of header

min As based on 200 bwd/fy	1.6 sq inches
min As based on eq 10-3	1.52 sq inches
As reqd based on bending model	1.30 sq inches

As reqd based on tie - strut model
assume Vu is focused @ the center of the header

then Tu =	95.14 k
As reqd =	1.76 sq inches

(3)-#7 = 1.8#

Site Structures
A Division of Kosnik Engineering PC

Project: VUECREST ESTATES
Sheet: 13
Date: 7/7/14
Job No: 5.14-045

FTG @ BACK OF OPNG

$W_{SERVICE} = 12.0^k/_1$ DL + LL

$P_s = (5+2)\,12 = 84^k$

$F_{brg} = 5\ ksf$ $\quad A = 84/5 = 16.8^{\square}$

USE 5'-0" SQ PAD $A = 25^{\square}$

$P_u = 6.9(5+2) = 118^k$ $\quad F_{brg} = 118/25 = 4.7^{ksf}$

$M_u = 2.5(4.7)\,1.25 = 14^{k\text{-}}/_1$

12" FTG $\quad d = 9/_2 = 8"$ $\quad A_s = \dfrac{14(12)}{54(8)} = 0.39^{\#}/_1$

USE 14" THICK FTG W/
(6) #5 TB EA WAY $\quad A_s = 0.37^{\#}/_1$

SITE STRUCTURES
10511 19th Ave SE, Suite C
Everett, WA, (425)-357-9600

Project Vuecrest Estates

sheet 14
date 7/7/14
prj. no. S-14-045

Design Data : Wall Foundation Loads Analysis

Soil Desity	125 pcf	Per. wall Cell Width	23 ft
Soil Cover over the lid	1.5 ft	Int. wall Cell Width left	23 ft
Plank weight	90 psf	Int. wall Cell Width right	23 ft
Uniform Live Load	150 psf		
Truck Rating	HS20-44		
Wall Height	16.25 ft		

Front Axle Load	8000 lbs
Rear Axle #1 Load	32000 lbs
Rear Axle #2 Load	32000 lbs
Total vehicle wt	72000 lbs

Truck Wheel Load Distribution to Perimeter Wall Foundation

Truck Perpendicular to the perimeter wall w/ rear axle #2 directly over wall & distance to axle #1 = 14ft

total truck load to wall = 44522 lbs
distribution width = 43.5 ft
Load @ base of wall = **1023** plf

Truck Parallel to the perimeter wall w/ one wheel over wall & 2nd wheel on plank (incl axle 1&2 only)

total truck load to wall = 55652 lbs
calc distribution width = 51.5 ft
Load @ base of wall = **1081** plf

Truck Wheel Load Distribution to Interior Wall Foundation

Truck Perpendicular to the int. wall w/ rear axle #2&#1 centered over the wall & dist between axles = 14ft

total truck load to wall = 44522 lbs
distribution width = 43.5 ft
Load @ base of wall = **1023** plf

Truck Perpendicular to the interior wall w/ rear axle #2 directly over wall & distance to axle #1 = 14ft

total truck load to wall = 44522 lbs left plank
Load @ base of wall = **1023** plf
total truck load to wall = 44522 lbs right plank
Load @ base of wall = **1023** plf
distribution width = 43.5 ft

Truck Parallel to the interior wall w/ one wheel over wall & 2nd wheel on plank (incl axle 1&2 only)

total truck load to wall = 55652 lbs left plank
Load @ base of wall = **1081** plf
total truck load to wall = 55652 lbs right plank
Load @ base of wall = **1081** plf
distribution width = 51.5 ft

Truck Parallel to the interior wall w/ the truck centered over the wall (incl axle 1&2 only)

total truck load to wall = 55652 lbs
distribution width = 51.5 ft
Load @ base of wall = **1081** plf

Uniform Live Load distribution to Wall Footings

Perimeter Wall **1725** plf
Interior Wall **3450** plf

SITE STRUCTURES
10511 19th Ave SE, Suite C
Everett, WA, (425)-357-9600

Project Vuecrest Estates

sheet 15
date 7/7/14
prj. no. S-14-045

Design Data : Wall Foundation Design

Allowable Bearing Pressure	4000 psf	Per. wall Cell Width	23 ft
Rebar strength fy =	60 ksi	Int. wall Cell Width left	23 ft
Concrete strength =	3000 psi	Int. wall Cell Width right	23 ft
Soil Desity	125 pcf	Plank weight	90 psf
Soil Cover over the lid	1.5 ft	Wall Height	16.25 ft
		Wall Thickness	12 inches

Perimeter Wall Footing Design

		L.F	Wu
Design live load	1725 plf	1.6	2760 plf
Soil Cover dead load	2344 plf	1.2	2812.5 plf
Plank dead load	1125 plf	1.2	1350 plf
Wall dead load	2437.5 plf	1.2	2925 plf
total dead load	5906 plf		7087.5 plf
Total live + dead Load	7631 plf		9848 plf

Required Ftg Width 1.91 ft
Selected Ftg Width 2.33 ft Selected Ftg Thickness 14 in

F8&c14

Qu =	4226 psf	Mu =	935 ft-lbs	at face of wall
		Vu =	2811 plf	at face of wall
As regd =	0.02 sq-in/ft	phi Vn=	11732 plf	at face of wall
Asmin =	0.43 sq-in/ft			
1.33 x As regd =	0.03 sq-in/ft			

Interior Wall Footing Design

		L.F	Wu
Design live load	3450 plf	1.6	5520 plf
Soil Cover dead load	4313 plf	1.2	5175 plf
Plank dead load	2070 plf	1.2	2484 plf
Wall dead load	2437.5 plf	1.2	2925 plf
total dead load	8820 plf		10584 plf
Total live + dead Load	12270 plf		16104 plf

Required Ftg Width 3.07 ft
Selected Ftg Width 3.5 ft Selected Ftg Thickness 14 in

F9&c14

Qu =	4601 psf	Mu =	3595 ft-lbs	at face of wall
		Vu =	5751 plf	at face of wall
As regd =	0.08 sq-in/ft	phi Vn=	11732 plf	at face of wall
Asmin =	0.43 sq-in/ft			
1.33 x As regd =	0.10 sq-in/ft			

SITE STRUCTURES
10511 19th Ave SE, Suite C
Everett, WA, (425)-357-9600

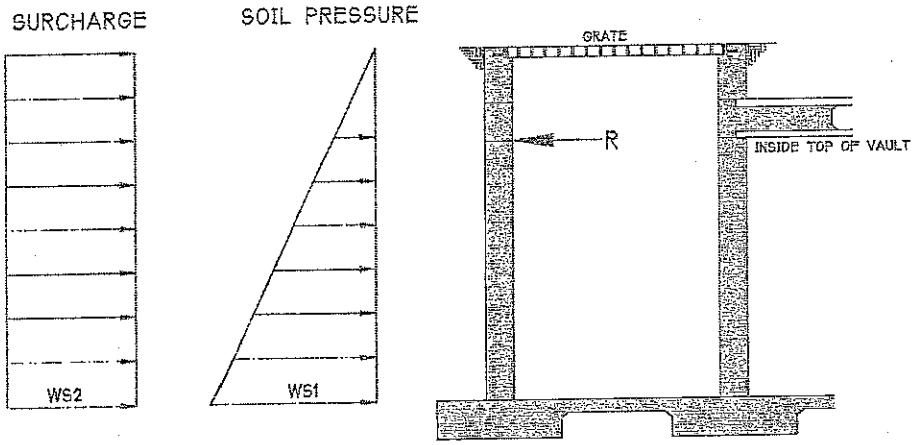
Project Vuecrest Estates

sheet: 16
date: 7/7/14
prj. no. S-14-045

Reinforcing at Top of Wall Below Grated Opening

Design Data

Top of Footing to Inside Top of Vault (H1)	16.25 ft	curb height	1.5 ft
Top of Footing to Finished Grade (H2)	18.75 ft	curb horz reinf bar	4
Soil Pressure EFW	55 pcf	curb horz reinf spacing	12 in o/c
Controlling Lateral Surcharge	70 psf	depth to center of reinf	3 in
Grating Span	10 ft	curb thickness	6 in



Ws1 = 1031.25
Ws2 = 70

Calculated Design Forces

$F_{bot\ of\ curb}$ =	152.5 plf	$Mu_{horz\ curb}$ =	1906 ft-lbs	curb self-supported
$F_{bot\ of\ wall}$ =	1101.25 plf	ϕMn_{curb} =	3726 ft-lbs	
$M_{wall\ uniform}$ =	22689 ft-lbs	$M_{base\ of\ wall}$ =	62023 ft-lbs	
$M_{wall\ triangle}$ =	39334 ft-lbs	R =	3817 plf	
Load Factor	1.6	$Mu_{horz\ wall}$ =	76337 ft-lbs	
Wu =	6107			

Wall Reinforcing

Wall Thickness	12 in	Addl Horz Reinf	6
Clear Cover	2 in	# of Addl Bars	4
Vert Rebar Size	8	As @ Top of Wall	1.77 sq-in
Rebar Area	0.79 sq-in		
conc strength f'c	4000 psi	depth to reinf (d)	8.63 in
Closure Reinf	(3) - # 6	comp block (a)	2.27 in
As in Closure	1.33 sq-in	d - a/2	7.49 in

ΦMn = **104203** ft-lbs **Mu =** **76337** ft-lbs

SITE STRUCTURES
10511 19th Ave SE, Suite C
Everett, WA, (425)-357-9600

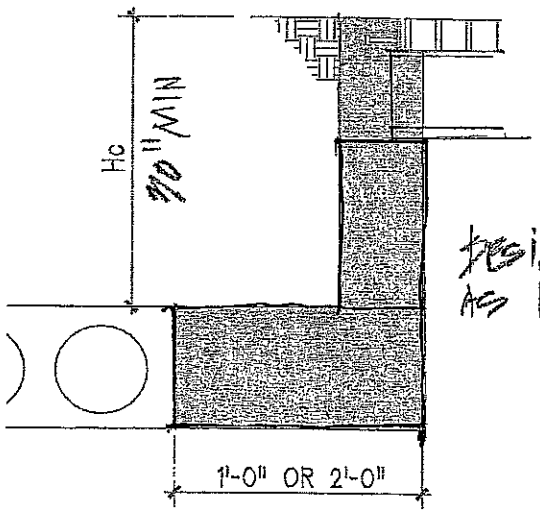
Project VUECREST

sheet: 17
date: 7/7/14
prj. no. S-14-045

Beam Design Below Grated Opening

Design Data

Height of Curb:	2.5	ft
Curb Thickness:	8	in
Soil Density:	125	pcf
Beam Width:	12	in
Beam Span:	6.67	ft
Truck Rear Axle Load:	32	k



DESIGN AS L. BM.

Calculated Design Forces

Soil Weight =	104	plf
Curb Weight =	250	plf
Self Weight =	156	plf
Max Beam Reaction	23000	lb

Load Factor: DL 1.2
LL 1.6

Wu = 613 plf
Pu = 36800 lb

Design for Flexure

Reinf Size	6	
# of Top & Bot Reinf	3	
Area of Steel	1.33	sq-in
Depth to Reinf (d)	28.13	in
Comp Block (a)	2.60	in
d - a/2	26.83	in

USE (3)#6c 12" WIDE BM
(4)#6c 24" WIDE BM

ΦMn = 159987 ft-lbs **Mu =** 102270 ft-lbs

Design for Shear

Tie Reinf Size	4	
Area of Steel	0.20	
Depth to Reinf (d)	10.50	
Max Spacing	5.25	in
Reinf Spacing	5	in

ADD WALL SHEAR CAPACITY
8" WIDE x (30 + 12) = 42" DEEP d = 40"
$\phi V_c = 0.75(2).050(8)\,40 = 24{,}000$ lbs
$\phi V_s = 0.75(0.31)60(40/12) = 46{,}900$ lbs
70,900 lbs

ΦVc = 5866 lbs

ΦVs = 42057 lbs

ΦVc +ΦVs = 47923 lbs **Vu =** 61331 lbs

ok

Site Structures
A Division of Kosnik Engineering PC

Project VUECREST ESTATES Sheet 18
Date 7/7/14
Job No S-14-045

GRATING SELECTION

PER LOADING 100 PSF - 5'-0" SPAN

SEE CHART ON FOLLOWING PAGE

1¼ x 3/16 BRG BARS 19-4 GRATING

W/ ¼" MAX DEFL 5'-6" MAX SPAN

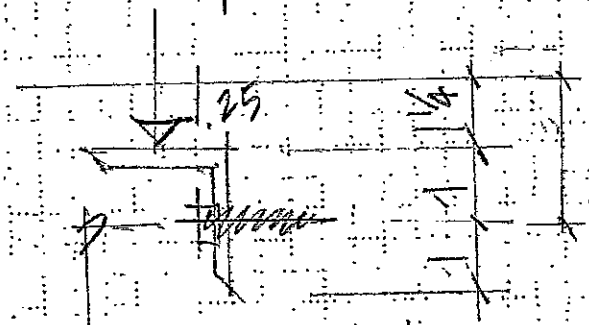
CAPACITY MAX UNIFORM — 196 PSF
@ 6'-0" SPAN CONCENTRATED - 535 lbs

SELECT 1¼ x 3/16 GRATING

LEDGER ANGLE

WTL = 108 (2.5) = 270 PLF

TRY ANGLE 2x2x3/16



¢ TITEN ANCHOR

T = 108 (1.25/0.75) = 180 #/

V = 108 #/

LOAD ADJUSTMENT FACTORS

TENSION 0.90

SHEAR $\frac{0.82+0.45}{2}$ = 0.39

f'_c = 3000 PSI

3/8" ¢ 2¾" EMB

T_{allow} = 0.90 (1316) = 1183

V_{allow} = 0.39 (1665) = 649

PLACE ANCHORS @ 18" o/c MAX

T = 120 # << 1183 #

V = 182 # << 649 #

STEEL BAR GRATING LOAD TABLE

19-4 / 19-2 LOAD TABLE

BEARING BAR SIZE		UNSUPPORTED SPAN 2'-0"	2'-6"	3'-0"	3'-6"	4'-0"	4'-6"	5'-0"	5'-6"	6'-0"	6'-6"	7'-0"	8'-0"	9'-0"	WEIGHT PER SQ. FT. (LBS.) 19-4	19-2	15-4	15-2	11-4	11-2	7-4	7-2
3/4 X 1/8	U	355	227	158	116	89	70								4.0	4.8	4.9	5.7	6.4	7.2	9.7	10.7
	UC	.099	.155	.223	.304	.397	.503															
	C	355	284	237	203	178	158															
	D	.079	.124	.179	.243	.318	.402															
3/4 X 3/16	U	532	340	236	173	133	105								5.6	6.4	6.9	7.7	9.2	10.0	14.5	16.0
	UC	.074	.116	.167	.228	.298	.377															
	C	532	426	355	304	266	237															
	D	.059	.093	.134	.182	.238	.302															
1 X 1/8	U	632	404	281	206	156	125	101	84	70					5.1	5.9	6.2	7.1	8.2	9.0	12.9	14.2
	UC	.074	.116	.166	.226	.296	.377	.466	.563	.670												
	C	632	505	421	361	316	281	253	230	211												
	D	.060	.093	.134	.182	.238	.302	.372	.451	.536												
1 X 3/16	U	1055	675	469	344	263	208	169	139	117					7.4	8.4	9.2	10.2	12.1	13.1	19.4	21.3
	UC	.044	.069	.100	.136	.178	.226	.279	.338	.402												
	C	1055	844	703	602	527	469	422	383	352												
	D	.036	.056	.080	.109	.143	.181	.223	.270	.321												
1-1/4 X 1/8	U	987	632	439	322	247	195	158	130	110	93	81			6.4	7.4	7.8	8.8	10.3	11.3	15.8	17.1
	UC	.060	.093	.134	.182	.238	.302	.372	.451	.536	.629	.730										
	C	987	789	658	564	493	439	395	359	329	304	282										
	D	.048	.074	.107	.146	.191	.241	.298	.360	.429	.504	.584										
1-1/4 X 3/16	U	1582	1013	704	517	396	313	253	209	176	150	130			9.0	10.0	11.2	12.2	14.9	15.9	23.8	25.7
	UC	.035	.055	.080	.109	.142	.181	.223	.270	.321	.377	.438										
	C	1582	1266	1055	904	791	703	633	575	527	487	452										
	D	.029	.044	.064	.087	.114	.145	.178	.216	.257	.302	.350										
1-1/2 X 1/8	U	1421	909	632	464	355	281	227	188	158	135	116	89	70	7.4	8.4	9.2	10.2	12.1	13.1	18.8	20.0
	UC	.050	.078	.112	.152	.199	.251	.310	.376	.447	.524	.608	.794	1.006								
	C	1421	1137	947	812	711	632	568	517	474	437	406	355	316								
	D	.040	.062	.089	.122	.159	.201	.248	.300	.358	.420	.487	.636	.804								
1-1/2 X 3/16	U	2373	1519	1055	776	594	469	380	314	264	225	195	149	118	11.1	12.5	13.7	15.1	18.1	19.6	28.1	30.1
	UC	.027	.042	.060	.082	.107	.135	.167	.202	.241	.283	.328	.428	.542								
	C	2373	1898	1582	1355	1186	1055	949	863	791	731	679	593	527								
	D	.022	.033	.048	.065	.085	.108	.134	.162	.193	.227	.263	.343	.434								
1-3/4 X 3/16	U	2901	1847	1289	947	725	573	464	384	322	275	237	181	143	12.7	14.1	15.7	17.1	20.9	22.3	32.5	34.4
	UC	.043	.067	.096	.130	.170	.215	.266	.322	.383	.450	.521	.681	.862								
	C	2901	2321	1934	1658	1451	1289	1161	1055	967	893	829	725	645								
	D	.034	.053	.077	.104	.136	.172	.213	.257	.306	.360	.417	.545	.689								
2-1/4 X 3/16	U	3720	2369	1653	1214	930	735	595	492	413	353	304	233	184	14.3	15.7	17.8	19.2	23.7	25.1	36.9	38.8
	UC	.033	.052	.075	.102	.133	.168	.207	.250	.298	.350	.406	.530	.670								
	C	3720	2976	2480	2126	1860	1653	1488	1353	1240	1145	1063	930	827								
	D	.026	.041	.060	.081	.108	.134	.166	.200	.238	.280	.324	.424	.536								
2-1/4 X 1/4	U	4796	3069	2132	1566	1199	947	767	634	533	454	392	300	237	15.9	17.4	19.8	21.2	26.5	27.9	41.3	43.2
	UC	.025	.039	.056	.077	.101	.127	.157	.190	.226	.265	.308	.402	.508								
	C	4796	3837	3197	2741	2398	2132	1918	1744	1598	1476	1370	1199	1066								
	D	.020	.031	.045	.061	.080	.101	.126	.153	.182	.214	.248	.324	.409								
2-1/4 X 3/16	U	5591	3577	2485	1825	1398	1104	894	739	621	529	457	350	277	17.5	19.0	21.8	23.3	29.2	30.7	45.6	47.5
	UC	.017	.026	.038	.052	.068	.086	.106	.129	.153	.180	.209	.273	.345								
	C	5591	4473	3727	3195	2795	2485	2236	2033	1864	1720	1597	1398	1242								
	D	.014	.021	.031	.042	.055	.070	.086	.104	.124	.145	.169	.220	.279								

LOADS AND DEFLECTIONS ARE THEORETICAL VALUES BASED ON 18,000 PSI UNIT STRESS. FOR PEDESTRIAN COMFORT DEFLECTIONS IN EXCESS OF 1/4" ARE NOT RECOMMENDED.

U = SAFE UNIFORM LOAD, LBS. PER SQ. FT.
C = SAFE CONCENTRATED MID-SPAN LOAD, LBS. PER FT. OF GRATING WIDTH
D = DEFLECTION IN INCHES

NOTE: WHEN GRATINGS WITH SERRATED BEARING BARS ARE SELECTED, THE DEPTH OF GRATING REQUIRED TO SERVICE A SPECIFIED LOAD WILL BE 1/4" GREATER THAN THAT SHOWN IN THE TABLES ABOVE.

CONVERSION TABLE

The loads shown above are for type 19-4 and 19-2 gratings. To determine the load carrying capacity for alternative bar spacings, multiply the loads given by the following conversion factors (DEFLECTION REMAINS CONSTANT):

FOR TYPES 15-4 AND 15-2: 1.26 *FOR TYPES 11-4 AND 11-2: 1.72* *FOR TYPES 7-4 AND 7-2: 2.71*

SELECTION GUIDE: 19-4 PLAIN SURFACE GRATING

For deflection of not more than 1/4" when subjected to the severest of the following: (1) the uniform loads below; (2) under concentrated mid-span loads of 300 lbs. up to 6'-0" span; or (3) 400 lbs. for spans 6'-0" and over.

SAFE UNIFORM LOAD LBS./SQ. FT.	2'-6"	3'-0"	3'-6"	4'-0"	4'-6"	5'-0"	5'-6"	6'-0"	6'-6"	7'-0"	8'-0"	9'-0"
50	1 x 1/8	1 x 1/8	1 x 1/8	1 x 1/8	1 x 3/16	1-1/4 x 1/8	1-1/4 x 3/16	1-1/2 x 3/16	1-3/4 x 3/16	1-3/4 x 3/16	2 x 3/16	2-1/4 x 3/16
75	1 x 1/8	1 x 1/8	1 x 1/8	1 x 1/8	1 x 3/16	1-1/4 x 1/8	1-1/4 x 3/16	1-1/2 x 3/16	1-3/4 x 3/16	1-3/4 x 3/16	2 x 3/16	2-1/4 x 3/16
100	1 x 1/8	1 x 1/8	1 x 1/8	1 x 1/8	1 x 3/16	1-1/4 x 1/8	1-1/4 x 3/16	1-1/2 x 3/16	1-3/4 x 3/16	1-3/4 x 3/16	2-1/4 x 3/16	2-1/2 x 3/16
125	1 x 1/8	1 x 1/8	1 x 1/8	1 x 1/8	1-1/4 x 1/8	1-1/4 x 3/16	1-1/2 x 1/8	1-1/2 x 3/16	1-3/4 x 3/16	2 x 3/16	2-1/4 x 3/16	–
150	1 x 1/8	1 x 1/8	1 x 1/8	1 x 3/16	1-1/4 x 1/8	1-1/4 x 3/16	1-1/2 x 3/16	1-3/4 x 3/16	1-3/4 x 3/16	2 x 3/16	2-1/2 x 3/16	–
200	1 x 1/8	1 x 1/8	1 x 1/8	1-1/4 x 1/8	1-1/4 x 3/16	1-1/2 x 3/16	1-3/4 x 3/16	1-3/4 x 3/16	2 x 3/16	2-1/4 x 3/16	–	–
300	1 x 1/8	1 x 3/16	1 x 3/16	1-1/4 x 3/16	1-1/2 x 3/16	1-3/4 x 3/16	2 x 3/16	2 x 3/16	2-1/4 x 3/16	2-1/2 x 3/16	–	–

SHEET 17
7/7/14
S-14-045
VUEREST

Tension Loads in Normal-Weight Concrete

Size in. (mm)	Drill Bit Dia. in.	Embed. Depth in. (mm)	Critical Edge Dist. in. (mm)	Critical Spacing Dist. in. (mm)	Tension Load: f'c ≥ 2000 psi (13.8 MPa) Concrete Ultimate lbs. (kN)	Std. Dev. lbs. (kN)	Allowable lbs. (kN)	f'c ≥ 3000 psi (20.7 MPa) Concrete Allowable lbs. (kN)	f'c ≥ 4000 psi (27.6 MPa) Concrete Ultimate lbs. (kN)	Std. Dev. lbs. (kN)	Allowable lbs. (kN)
3/8 (9.5)	3/8	2¾ (70)	3 (76)	6 (152)	4,297 (19.1)	•	1,075 (4.8)	1,315 (5.8)	5,204 (27.6)	•	1,550 (6.9)
		3¾ (95)			7,087 (31.5)	347 (1.5)	1,770 (7.9)	2,115 (9.4)	9,820 (43.7)	1,434 (6.4)	2,455 (10.9)
1/2 (12.7)	1/2	2¾ (70)	4 (102)	8 (203)	4,610 (20.9)	•	1,155 (5.1)	1,400 (6.2)	6,580 (29.3)	•	1,645 (7.3)
		3⅝ (92)			7,413 (33.0)	412 (1.8)	1,855 (8.3)	2,270 (10.1)	10,742 (47.8)	1,600 (7.1)	2,685 (11.9)
		5¾ (146)			10,278 (45.7)	297 (1.3)	2,570 (11.4)	3,240 (14.4)	15,640 (69.6)	2,341 (10.4)	3,910 (17.4)
5/8 (15.9)	5/8	2¾ (70)	5 (127)	10 (254)	4,610 (20.5)	•	1,155 (5.1)	1,400 (6.2)	6,580 (29.3)	•	1,645 (7.3)
		4⅛ (105)			8,742 (38.9)	615 (2.7)	2,185 (9.7)	2,630 (11.7)	12,286 (54.7)	1,604 (7.1)	3,070 (13.7)
		5¾ (146)			12,953 (57.6)	1,764 (7.8)	3,240 (14.4)	3,955 (17.6)	18,680 (83.1)	•	4,670 (20.8)
¾ (19.1)	¾	2¾ (70)	6 (152)	12 (305)	4,674 (20.8)	•	1,170 (5.2)	1,405 (6.3)	6,580 (29.3)	•	1,645 (7.3)
		4⅝ (117)			10,340 (46.0)	1,096 (4.9)	2,585 (11.5)	3,470 (15.4)	17,426 (77.5)	1,591 (7.1)	4,355 (19.4)
		5¾ (146)			13,765 (61.2)	1,016 (4.5)	3,440 (15.3)	4,055 (18.0)	18,680 (83.1)	1,743 (7.8)	4,670 (20.8)

See Notes Below

*See page 10 for an explanation of the load table icons

Shear Loads in Normal-Weight Concrete

Size in. (mm)	Drill Bit Dia. in.	Embed. Depth in. (mm)	Critical Edge Dist. in. (mm)	Critical Spacing Dist. in. (mm)	Shear Load: f'c ≥ 2000 psi (13.8 MPa) Concrete Ultimate lbs. (kN)	Std. Dev. lbs. (kN)	Allowable lbs. (kN)	f'c ≥ 3000 psi (20.7 MPa) Concrete Allowable lbs. (kN)	f'c ≥ 4000 psi (27.6 MPa) Concrete Ultimate lbs. (kN)	Std. Dev. lbs. (kN)	Allowable lbs. (kN)
3/8 (9.5)	3/8	2¾ (70)	4½ (114)	6 (152)	6,353 (28.3)	•	1,585 (7.1)	1,665 (7.4)	•	•	1,740 (7.7)
		3¾ (95)			6,377 (28.4)	1,006 (4.5)	1,595 (7.1)	1,670 (7.4)	•	•	1,740 (7.7)
1/2 (12.7)	1/2	2¾ (70)	6 (152)	8 (203)	6,435 (28.6)	•	1,605 (7.1)	2,050 (9.1)	9,987 (44.4)	•	2,495 (11.1)
		5⅜ (92)			9,324 (41.5)	1,285 (5.7)	2,330 (10.4)	2,795 (12.4)	13,027 (57.9)	597 (2.7)	3,255 (14.5)
		5¾ (146)			11,319 (50.3)	1,245 (5.5)	2,830 (12.6)	3,045 (13.5)	•	•	3,255 (14.5)
5/8 (15.9)	5/8	2¾ (70)	7½ (191)	10 (254)	7,745 (34.5)	•	1,940 (8.6)	2,220 (9.9)	9,987 (44.4)	•	2,495 (11.1)
		4⅛ (105)			8,706 (38.7)	1,830 (8.1)	2,175 (9.7)	3,415 (15.2)	18,607 (82.8)	1,650 (7.3)	4,650 (20.7)
		5¾ (146)			12,498 (55.6)	2,227 (9.9)	3,125 (13.9)	3,890 (17.3)	•	•	4,650 (20.7)
¾ (19.1)	¾	2¾ (70)	9 (229)	12 (305)	7,832 (34.8)	•	1,960 (8.7)	2,415 (10.7)	11,460 (51.0)	•	2,865 (12.7)
		4⅝ (117)			11,222 (49.9)	2,900 (12.9)	2,805 (12.5)	4,490 (20.0)	24,680 (109.8)	2,368 (10.5)	6,170 (27.4)
		5¾ (146)			19,793 (88.0)	3,547 (15.8)	4,950 (22.0)	5,560 (24.7)	24,680 (109.8)	795 (3.5)	6,170 (27.4)

1. The allowable loads listed are based on a safety factor of 4.0.
2. Allowable loads may be increased 33⅓% for short-term loading due to wind or seismic forces where permitted by code.
3. Refer to allowable load-adjustment factors for spacing and edge distance on pages 128–129.
4. The minimum concrete thickness is 1½ times the embedment depth.
5. Tension and Shear loads for the Titen HD anchor may be combined using the elliptical interaction equation (n=⅔). Allowable load may be interpolated for concrete compressive strengths between 2000 psi and 4000 psi.

June 24, 2014
ES-2660.01

Earth Solutions NW LLC

- Geotechnical Engineering
- Construction Monitoring
- Environmental Sciences

Geonerco Properties, LLC
1441 North 34th Street, #200
Seattle, Washington 98103

Attention: Mr. Jamie Waltier

Subject: Proposed Stormwater Vault
Vuecrest Residential Plat
Renton, Washington

Reference: D. R. Strong Consulting Engineers
Vuecrest Estates
Vault Detail Sheet
Dated June 19, 2014

Dear Jamie:

Earth Solutions NW, LLC (ESNW) has prepared this letter to provide an assessment regarding the weight of the proposed stormwater vault and its effect on the adjacent slope.

Based on information provided by the project structural engineer (Mr. Dan Kosnik, P.E.), the vault, when full and including 18 inches of soil cover will weigh 1,500 pounds per square foot. With a footprint of 5,900 square feet, the maximum weight of the vault will be 4,425 tons. Based on information provided by the project civil engineer (Mr. Maher Joudi, P.E.), the volume of soil displaced by the vault will be 3,676 cubic yards or 99,250 cubic feet. Using an in-situ soil unit weight of 120 pounds per cubic foot, the weight of soil displaced by the vault will be 5,955 tons. Therefore, even when the vault is full of water, it is 1,530 tons lighter than the soil it replaced.

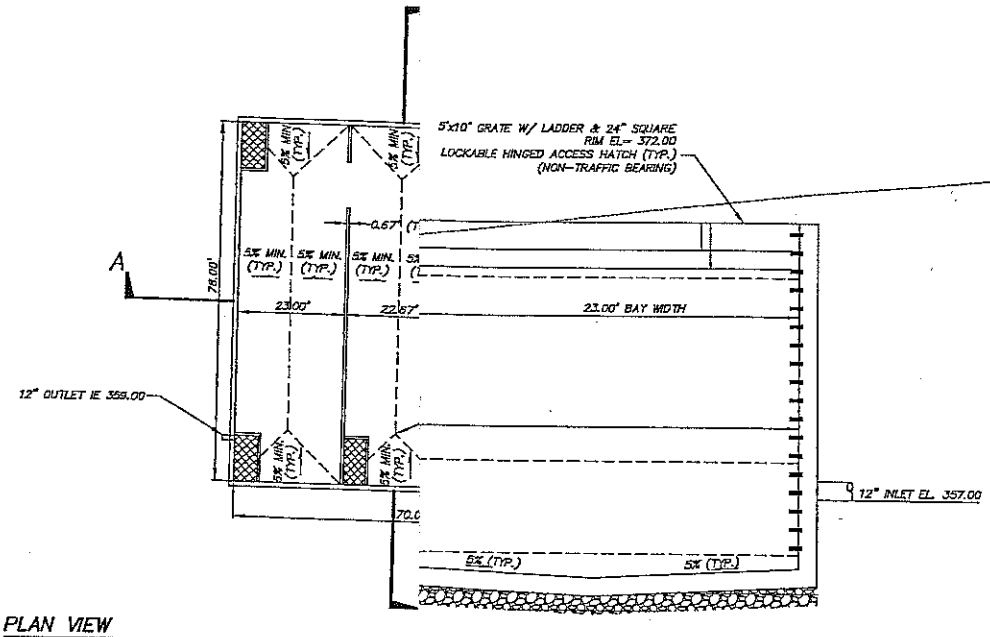
As currently designed, the setback from the top of the steep slope to the edge of the vault is 40 to 58 feet from the top of the steep slope. Given the setback from the slope and the fact that the vault will weigh 1,530 tons less than the soil it replaces, the vault will increase the overall stability of the slope

EXHIBIT 29

LUA13-000642

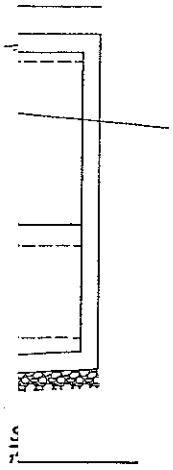
PROJECT NAME

VUECREST ESTATES



PLAN VIEW

1"=20'



NORTH

GRAPHIC SCALE

0 25 50 100

1 INCH = 50 FT.

Call 2 Working Days Before You Dig

811

Utilities Underground Location Center

(ID,MT,ND,OR,WA)

MAHER A. JOUDI
STATE OF WASHINGTON
EXPIRES
REGISTERED
PROFESSIONAL ENGINEER

OF
ON

Works Dept.

VUECREST ESTATES
PRELIMINARY PLAT
VAULT DETAILS

DATE: 06.19.14
FIELDBOOK:
PAGE:
DRAWING NO: 1
SHEET: 1 OF: 1

DRS PROJECT NO. 12102

A-NNNNAA

PLENMAR, R: \2012\1\12102\1\Drawings\Plats\PP1\Vault Details\05-3302102.dwg 6/19/2014 8:20:54 AM PDT

VUECREST PLAT
TRAFFIC IMPACT ANALYSIS

CITY OF RENTON

Prepared for

Jamie Waltier
Geonerco Properties WA, LLC
1441 N. 34th Street #200
Seattle, WA 98103

Prepared by

TraffEx
NORTHWEST TRAFFIC EXPERTS

11410 NE 124th St., #590
Kirkland, Washington 98034
Telephone: 425.522.4118
Fax: 425.522.4311

April 23, 2013

EXHIBIT 30

TraffEx
NORTHWEST TRAFFIC EXPERTS
11410 NE 124th St., #590 Kirkland, WA 98034
Phone: 425.522.4118 Fax: 425.522.4311

April 23, 2013

Geonerco Properties WA, LLC
Attn: Jamie Waltier
1441 N. 34th Street #200
Seattle, WA 98103

Re: Vuecrest Plat - City of Renton
Traffic Impact Analysis

Dear Mr. Waltier:

We are pleased to present this traffic impact analysis report for the proposed 21 lot Vuecrest Residential plat on Smithers Ave. S, south of S 47th St. in the City of Renton. Proposed access to the site is to be provided by a street connection to S. 47th Street

The scope of this analysis is based upon the preliminary plat site plan, conversations with City of Renton staff and the City of Renton Policy Guidelines for Traffic Impact Analysis for New Development.

Our summary, conclusions and recommendations begin on page 5 of this report.

PROJECT DESCRIPTION

Figure 1 is a vicinity map showing the location of the site and study area.

Figure 2 shows the preliminary site plan.

The site access street connects to Smithers Ave. at the north side of the site. It then runs to the south and curves to the east becoming 168th Pl. which then is stubbed to the east side of the site. The site access street will be constructed to City of Renton standards with curb, gutter and sidewalk on both sides.

Development of the Vuecrest plat is expected to occur by the year 2015. Therefore, for purposes of this study, 2015 is used as the horizon year.

TRIP GENERATION AND DISTRIBUTION

The 21 single-family units in the proposed Vuecrest Plat are expected to generate the vehicular trips during an average weekday and during the street traffic peak hours as shown below:

Time Period	*Trip Rate Trips per unit*	*Trips Entering*	*Trips Exiting*	*Total*
Average Weekday	9.57	100 50%	101 50%	201
AM Peak Hour	0.75	4 25%	12 75%	16
PM Peak Hour	1.01	13 63%	8 37%	21

A vehicle trip is defined as a single or one direction vehicle movement with either the origin or destination (exiting or entering) inside the study site.

The trip generation is calculated using the average trip rates in the Institute of Transportation Engineers (ITE) Trip Generation, Eighth Edition, for Single Family Detached Housing (ITE Land Use Code 210). These trip generation values account for all site trips made by all vehicles for all purposes, including resident, visitor, and service and delivery vehicle trips.

Figure 3 shows the estimated trip distribution and the calculated site-generated traffic volumes. The distribution is based on existing traffic volume patterns, the characteristics of the road network, the location of likely trip origins and destinations (employment, shopping, social and recreational opportunities), expected travel times, and previous traffic studies.

EXISTING PHYSICAL CONDITIONS

Street Facilities

The streets in the study area are classified per the City of Renton Comprehensive Plan as follows:

Smithers Ave.	Local Access
102nd Ave. SE (Main Ave S)	Local Access
SE 47th St.	Local Access

Smithers Ave. SE, SE 47th St., and 102nd Ave SE (Main Ave. S) in the project vicinity have a speed limit of 25 mph and consist of two lanes with curb gutter and sidewalk on both sides of the street. The streets in the area are straight and flat yielding excellent sight distance at the study intersections.

EXISTING TRAFFIC CONDITIONS

Traffic Volumes

Figure 4 shows existing, future without project and future with project PM peak hour traffic volumes at the proposed Site Access St./156th Ave. SE and Site Access St./158th Ave SE intersections. The City of Renton Policy Guidelines for Traffic Impact Analysis for New Development requires an analysis of intersections impacted by 30 or more project generated peak hour trips. The proposed project generates less than 30 PM peak hour trips and therefore no intersections meet this threshold. The SE 47th St./102nd Ave SE and SE 48th Pl./102nd Ave SE intersections were analyzed nonetheless, since they are the nearest intersections to the site and provide access to the site. PM peak hour traffic counts were performed at these intersections on Thursday, April 18, 2013 and are included in the Technical Appendix.

Level of Service Analysis

Level of Service (LOS) is a qualitative measure describing operational conditions within a traffic flow, and the perception of these conditions by drivers or passengers. These conditions include factors such as speed, delay, travel time, freedom to maneuver, traffic interruptions, comfort, convenience, and safety. Levels of service are given letter designations, from A to F, with LOS A representing the best operating conditions (free flow, little delay) and LOS F the worst (congestion, long delays). Generally, LOS A and B are high, LOS C and D are moderate and LOS E and F are low.

Table 1 shows calculated level of service (LOS) for existing and future conditions including project traffic at the pertinent street intersection. The LOS was calculated using the procedures in the Transportation Research Board Highway Capacity Manual The LOS shown indicates overall intersection operation. At intersections, LOS is determined by the calculated average control delay per vehicle. The LOS and corresponding average control delay in seconds are as follows:

TYPE OF INTERSECTION	A	B	C	D	E	F
Signalized	≤ 10.0	>10.0 and ≤20.0	>20.0 and ≤35.0	>35.0 and ≤55.0	>55.0 and ≤80.0	>80.0
Stop Sign Control	≤10.0	>10 and ≤15	>15 and ≤25	>25 and ≤35	>35 and ≤50	>50

FUTURE TRAFFIC CONDITIONS WITHOUT THE PROJECT

Figure 4 shows projected 2015 PM peak hour traffic volumes without the project. These volumes include the existing traffic volume counts plus background traffic growth.

The background growth factor accounts for traffic volumes generated from other approved but unbuilt subdivisions and general growth in traffic traveling through the area.

A 3% per year annual background growth rate was added for each year of the two year time period (for a total of 6%) from the 2013 traffic count to the 2015 horizon year of the proposal. The 3% per year growth rate should result in a conservative analysis since the growth in traffic volumes has remained relatively flat the last several years.

FUTURE TRAFFIC CONDITIONS WITH PROJECT

Figure 4 shows the projected future 2015 PM peak hour traffic volumes with the proposed project. The site-generated PM peak hour traffic volumes were added to the projected future without project volumes to obtain the future with project volumes.

Table 1 shows calculated LOS for future with project volumes at the study intersections. The study intersections are calculated to operate at an excellent LOS of A for future 2015 conditions including project-generated traffic.

TRAFFIC MITIGATION REQUIREMENTS

The City of Renton requires a Transportation Mitigation Fee payment of $75 per new daily trip attributed to new development. The net new daily trips due to this development are 201 trips. The estimated Transportation Mitigation Impact Fee is $15,075 (201 daily trips X $75 per daily trip).

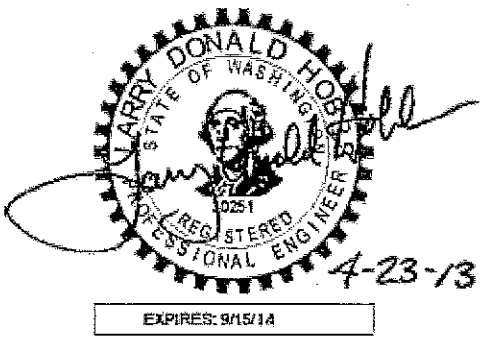
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

We recommend that the Vuecrest Plat be constructed as shown on the site plan with the following traffic impact mitigation measures:

- Construct the street improvements including curb, gutter and sidewalk to the project site streets to City of Renton standard.
- Contribute the approximately $15,075 Transportation Mitigation fee to the City of Renton.

No other traffic mitigation should be necessary. If you have any questions, please call 425-522-4118. You may also contact us via e-mail at vince@nwtraffex.com or larry@nwtraffex.com.

Very truly yours,



Vincent J. Geglia
Principal
TraffEx

Larry D. Hobbs, P.E.
Principal
TraffEx

TABLE 1

PM PEAK HOUR LEVEL OF SERVICE SUMMARY

VUECREST PLAT
TRAFFIC IMPACT ANALYSIS

INTERSECTION	*EXISTING 2013*	*2015 WITHOUT PROJECT*	*2015 WITH PROJECT*
S 47th St/ 102nd Ave. SE (Main Ave. S)	(A 7.2) NB	(A 7.2) NB	(A 7.3) NB
S 48th St/ 102nd Ave. SE. (Main Ave. S)	(A 8.4) EB	(A 8.4) EB	(A 8.4) EB

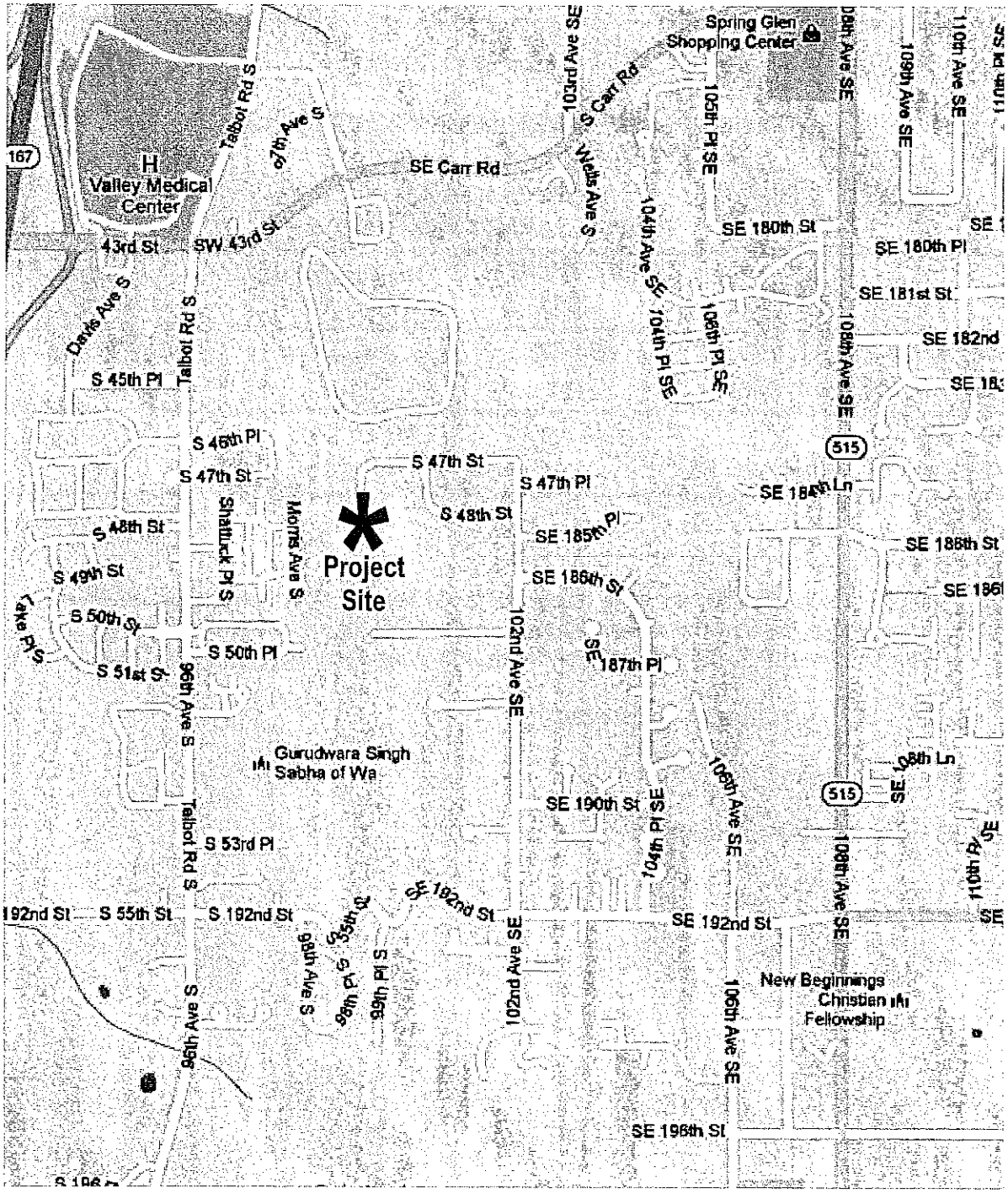
* Number shown is the average control delay in seconds per vehicle for the worst approach or movement which determines the LOS for an unsignalized intersection per the Transportation Research Board Highway Capacity Manual

(XX) LOS and average control delay

NB northbound approach

EB eastbound approach

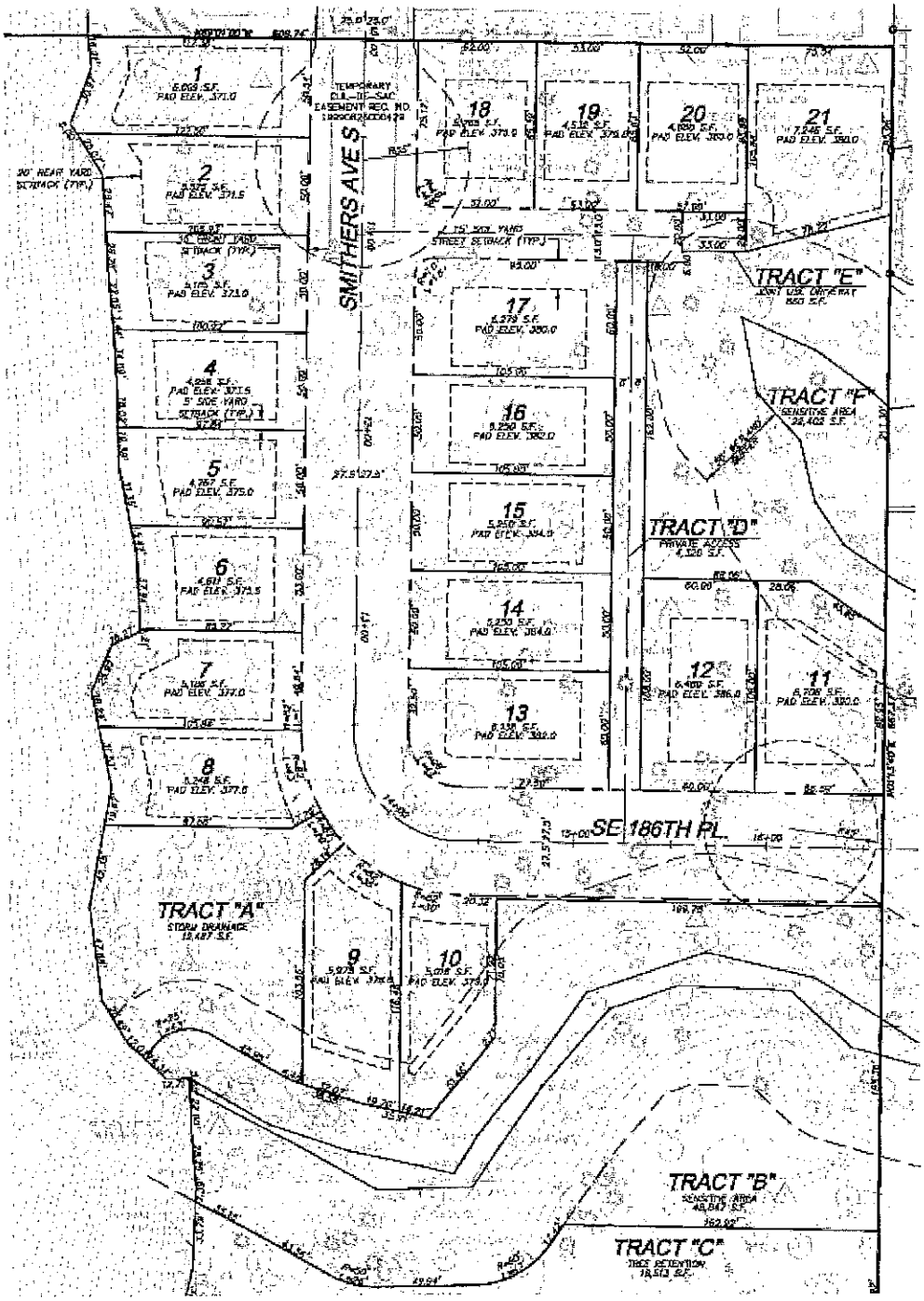
TraffEx
NORTHWEST TRAFFIC EXPERTS



Vuecrest Plat - City of Renton

Vicinity Map

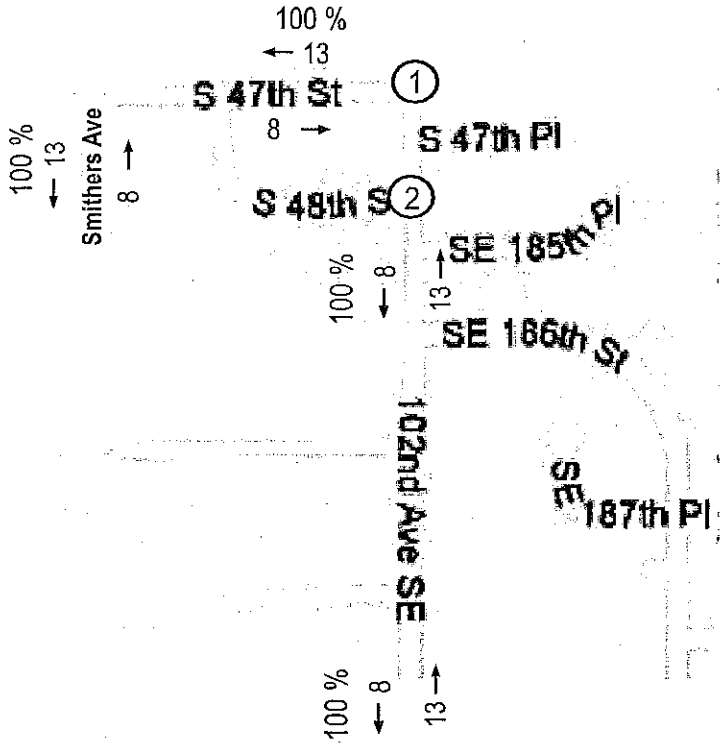
Figure 1

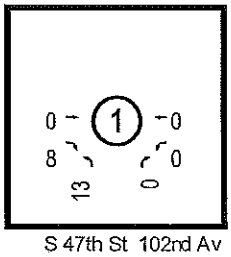


Vuecrest Plat - City of Renton

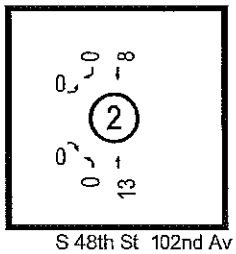
Site Plan

Figure 2





S 47th St 102nd Av



S 48th St 102nd Av

PM Peak Hour Traffic Volume

Enter	13
Exit	8
Total	21

Legend

15% Percentage of Project Traffic

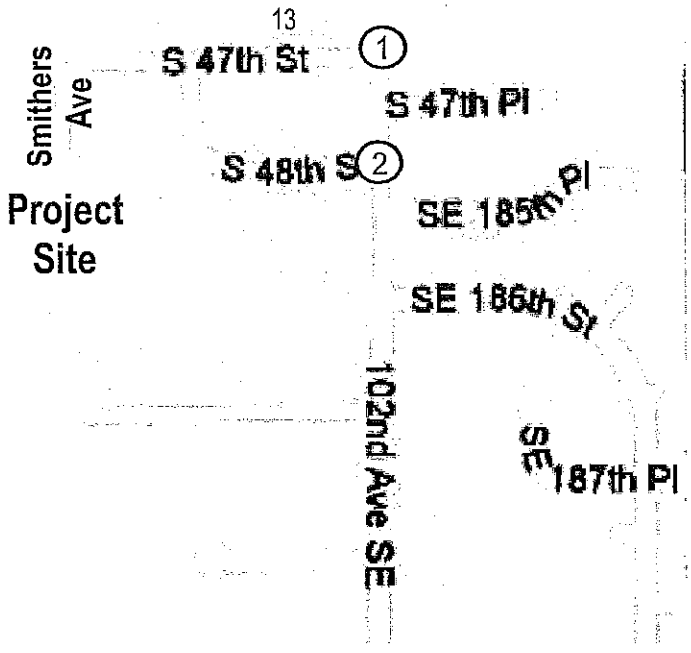
← 3 PM Peak Hour Traffic Volume

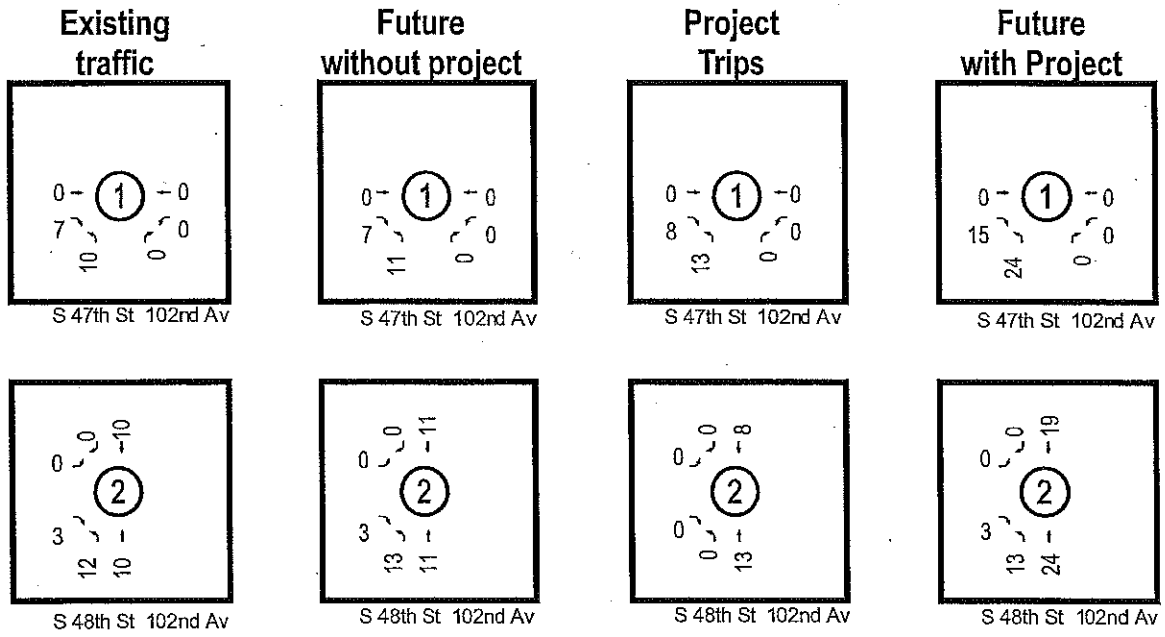
Vuecrest Plat - City of Renton

PM Peak Hour Trip Generation and Distribution

Figure 3

TraffEx
NORTHWEST TRAFFIC EXPERTS





Vuecrest Plat - City of Renton

Existing and Future PM Peak Hour Traffic Volumes

Figure 4

TECHNICAL APPENDIX

Prepared for: Traffex

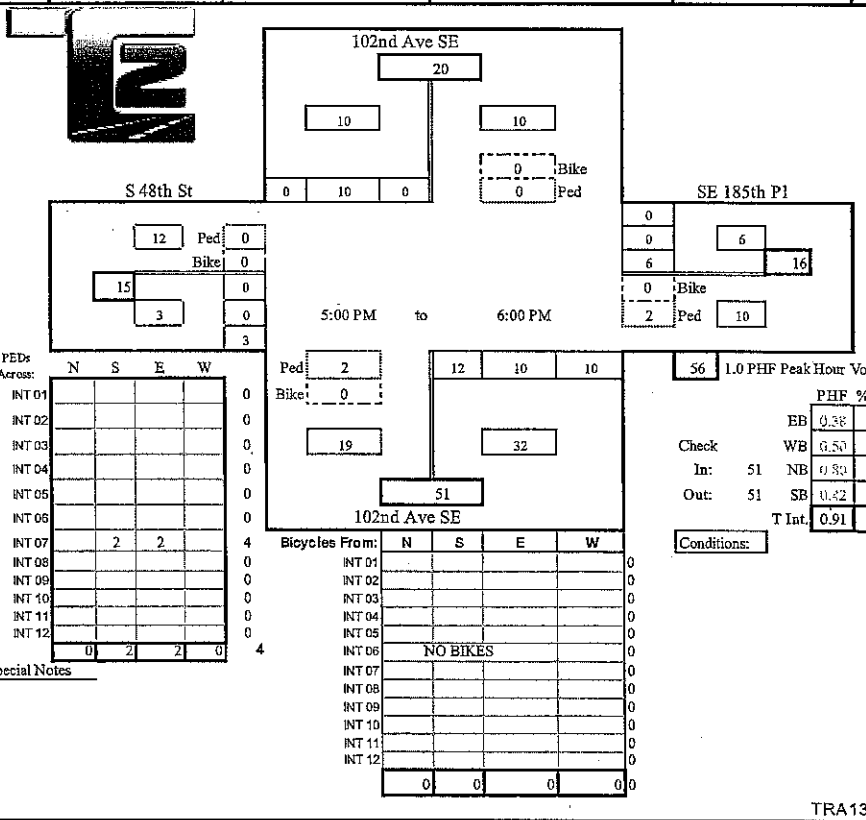
Traffic Count Consultants, Inc.

Phone: (253) 926-6009 FAX: (253) 922-7211 E-Mail: Team@TC2inc.com

WBE/DBE

Intersection: 102nd Ave SE & S 185th Pl/S 48th St
Location: Renton, Washington
Date of Count: Thurs 04/18/2013
Checked By: Jess

Time Interval	From North on (SB) 102nd Ave SE				From South on (NB) 102nd Ave SE				From East on (WB) SE 185th Pl				From West on (EB) S 48th St				Interval Total
Ending at	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
4:15 P	0	0	1	0	0	2	3	1	0	0	0	1	0	0	1	2	11
4:30 P	0	0	1	1	0	1	4	5	0	0	0	0	0	0	0	0	12
4:45 P	0	1	2	0	0	2	2	1	0	1	0	0	0	0	0	0	9
5:00 P	0	0	2	0	0	3	4	0	0	1	0	0	0	0	0	0	10
5:15 P	0	0	6	0	0	2	2	1	0	1	0	0	0	0	0	0	12
5:30 P	0	0	2	0	0	3	2	4	0	1	0	0	0	0	0	0	12
5:45 P	0	0	2	0	0	5	2	3	0	1	0	0	0	0	0	1	14
6:00 P	0	0	0	0	0	2	4	2	0	3	0	0	0	0	0	2	13
6:15 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Survey	0	1	16	1	0	20	23	17	0	8	0	1	0	0	1	5	93
Peak Hour: 5:00 PM to 6:00 PM																	
Total	0	0	10	0	0	12	10	10	0	6	0	0	0	0	0	3	51
Approach	10				32				6				3				51
%HV	n/a				n/a				n/a				n/a				0.0%
PHF	0.42				0.80				0.50				0.38				0.91



PEDs Across:	N	S	E	W	
INT 01					0
INT 02					0
INT 03					0
INT 04					0
INT 05					0
INT 06					0
INT 07		2	2		4
INT 08					0
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	0	2	2	0	4

Bicycles From:	N	S	E	W	
INT 01					0
INT 02					0
INT 03					0
INT 04					0
INT 05					0
INT 06	NO BIKES				0
INT 07					0
INT 08					0
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	0	0	0	0	0

56 1.0 PHF Peak Hour Volume

		PHF	%HV
	EB	0.38	n/a
Check	WB	0.50	n/a
In: 51	NB	0.80	n/a
Out: 51	SB	0.42	n/a
	T Int.	0.91	0.0%

Conditions:

Special Notes

TRA13067M_01p

Prepared for: Traffex

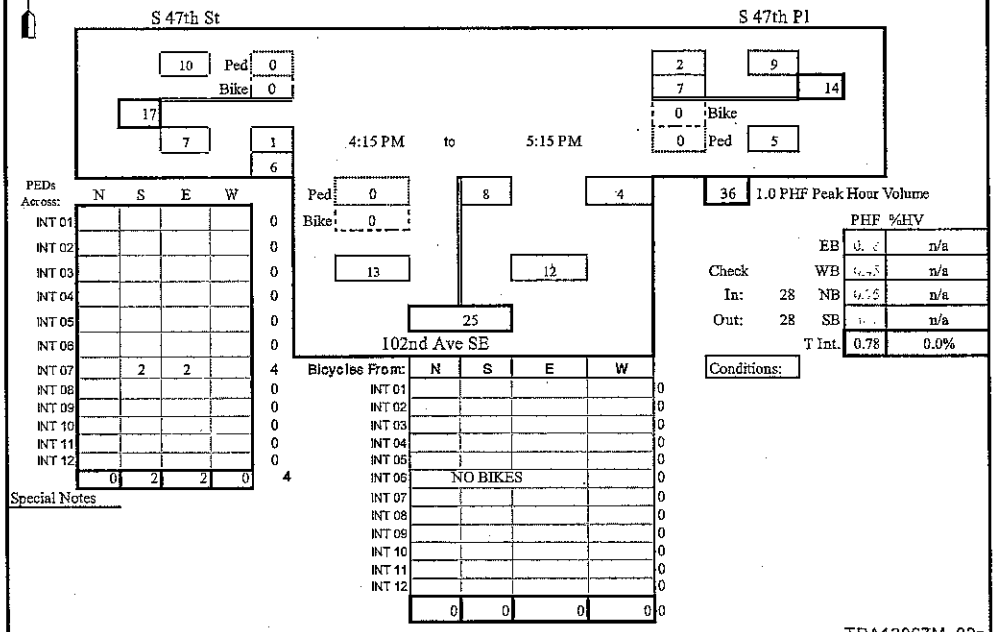
Traffic Count Consultants, Inc.

Phone: (253) 926-6009 FAX: (253) 922-7211 E-Mail: Team@TC2inc.com

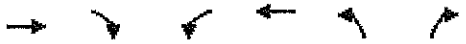
WBE/DBE

Intersection: 102nd Ave SE & S 47th Pl/S 47th St
Location: Renton, Washington
Date of Count: Thurs 04/18/2013
Checked By: Jess

Time Interval	From North on (SB) 0				From South on (NB) 102nd Ave SE				From East on (WB) S 47th Pl				From West on (EB) S 47th St				Interval Total
Ending at	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
4:15 P	0	0	0	0	0	3	0	1	0	1	1	0	0	0	1	0	7
4:30 P	0	0	0	0	0	4	0	0	0	1	0	0	0	0	1	1	7
4:45 P	0	0	0	0	0	2	0	0	0	2	1	0	0	0	0	1	6
5:00 P	0	0	0	0	0	2	0	2	0	0	0	0	0	0	0	2	6
5:15 P	0	0	0	0	0	0	0	2	0	4	1	0	0	0	0	2	9
5:30 P	0	0	0	0	0	0	0	2	0	0	1	0	0	0	0	2	5
5:45 P	0	0	0	0	0	2	0	0	0	1	0	0	0	0	0	1	4
6:00 P	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	4
6:15 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Survey	0	0	0	0	0	17	0	7	0	9	4	0	0	0	2	9	48
Peak Hour: 4:15 PM to 5:15 PM																	
Total	0	0	0	0	0	8	0	4	0	7	2	0	0	0	1	6	28
Approach	0				12				9				7				28
%HV	n/a				n/a				n/a				n/a				0.0%
PHF	n/a				0.75				0.56				0.58				0.78



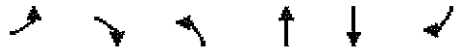
TRA13067M_02p



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	0	7	0	0	10	0
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78
Hourly flow rate (vph)	0	9	0	0	13	0

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total (vph)	9	0	13
Volume Left (vph)	0	0	13
Volume Right (vph)	9	0	0
Hadj (s)	-0.60	0.00	0.20
Departure Headway (s)	3.3	3.9	4.1
Degree Utilization, x	0.01	0.00	0.01
Capacity (veh/h)	1069	900	859
Control Delay (s)	6.4	6.9	7.2
Approach Delay (s)	6.4	0.0	7.2
Approach LOS	A	A	A

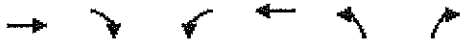
Intersection Summary			
Delay	6.8		
HCM Level of Service	A		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	3	12	10	10	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	0	3	13	11	11	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	48	11	11			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	48	11	11			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	99			
cM capacity (veh/h)	958	1076	1621			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	3	24	11
Volume Left	0	13	0
Volume Right	3	0	0
cSH	1076	1621	1700
Volume to Capacity	0.00	0.01	0.01
Queue Length 95th (ft)	0	1	0
Control Delay (s)	8.4	4.0	0.0
Lane LOS	A	A	
Approach Delay (s)	8.4	4.0	0.0
Approach LOS	A		

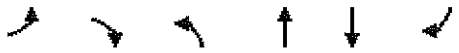
Intersection Summary			
Average Delay	3.2		
Intersection Capacity Utilization	17.9%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	0	7	0	0	11	0
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78
Hourly flow rate (vph)	0	9	0	0	14	0

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total (vph)	9	0	14
Volume Left (vph)	0	0	14
Volume Right (vph)	9	0	0
Hadj (s)	-0.60	0.00	0.20
Departure Headway (s)	3.3	3.9	4.1
Degree Utilization, x	0.01	0.00	0.02
Capacity (veh/h)	1068	900	859
Control Delay (s)	6.4	6.9	7.2
Approach Delay (s)	6.4	0.0	7.2
Approach LOS	A	A	A

Intersection Summary			
Delay	6.9		
HCM Level of Service	A		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	3	13	11	11	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	0	3	14	12	12	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	53	12	12			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	53	12	12			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	99			
cM capacity (veh/h)	952	1074	1620			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	3	26	12
Volume Left	0	14	0
Volume Right	3	0	0
cSH	1074	1620	1700
Volume to Capacity	0.00	0.01	0.01
Queue Length 95th (ft)	0	1	0
Control Delay (s)	8.4	4.0	0.0
Lane LOS	A	A	
Approach Delay (s)	8.4	4.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	3.2		
Intersection Capacity Utilization	18.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	0	15	0	0	24	0
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78
Hourly flow rate (vph)	0	19	0	0	31	0

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total (vph)	19	0	31
Volume Left (vph)	0	0	31
Volume Right (vph)	19	0	0
Hadj (s)	-0.60	0.00	0.20
Departure Headway (s)	3.4	4.0	4.1
Degree Utilization, x	0.02	0.00	0.04
Capacity (veh/h)	1052	900	854
Control Delay (s)	6.4	7.0	7.3
Approach Delay (s)	6.4	0.0	7.3
Approach LOS	A	A	A

Intersection Summary			
Delay	7.0		
HCM Level of Service	A		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	3	13	24	19	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	0	3	14	26	21	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	76	21	21			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	76	21	21			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	99			
cM capacity (veh/h)	924	1062	1608			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	3	41	21
Volume Left	0	14	0
Volume Right	3	0	0
cSH	1062	1608	1700
Volume to Capacity	0.00	0.01	0.01
Queue Length 95th (ft)	0	1	0
Control Delay (s)	8.4	2.6	0.0
Lane LOS	A	A	
Approach Delay (s)	8.4	2.6	0.0
Approach LOS	A		

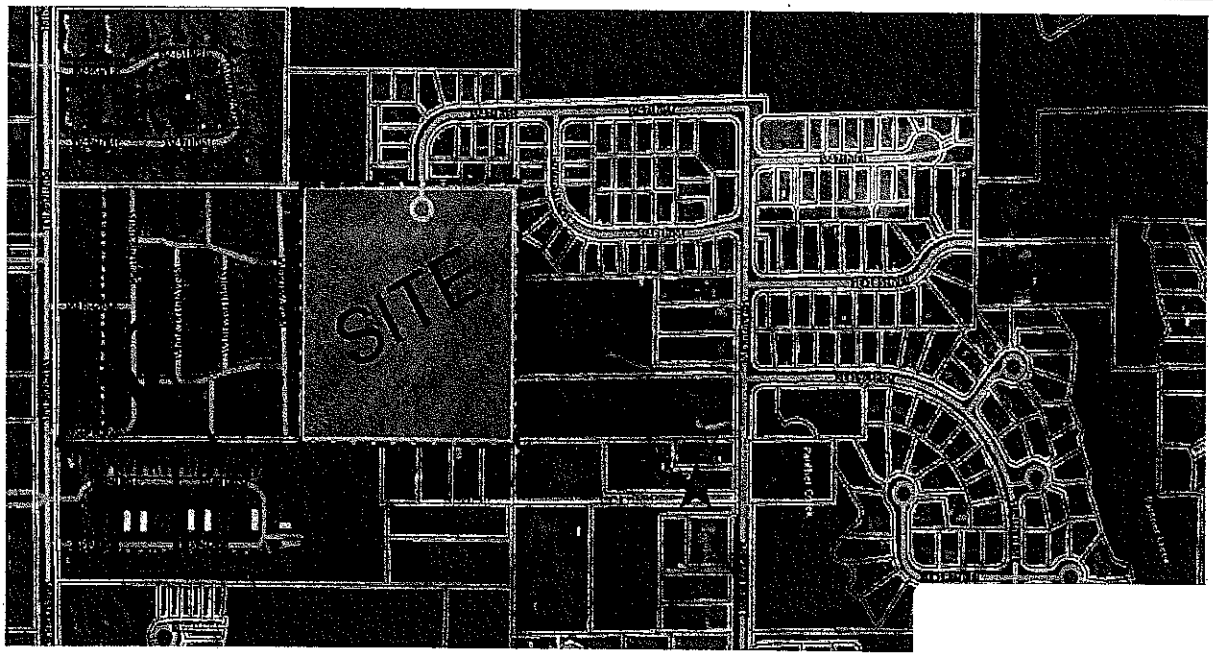
Intersection Summary			
Average Delay	2.1		
Intersection Capacity Utilization	18.6%	ICU Level of Service	A
Analysis Period (min)	15		

DEPARTMENT OF COMMUNITY AND ECONOMIC DEVELOPMENT

City of Renton

ENVIRONMENTAL COMMITTEE REVIEW REPORT, REVISED

ERC MEETING DATE:	~~July 15, 2013~~ August 18, 2014	
Project Name:	Vuecrest Estates	Entire Document Available Upon Request
Project Number:	LUA13-000642; ECF, PP, MOD	
Project Manager:	Elizabeth Higgins, Senior Planner	
Owner:	Schneider Homes I, LLC; 6510 Southcenter Blvd #1; Tukwila WA 98188	
Applicant:	Jamie Waltier; Harbour Homes; 1441 N 34th St #200; Seattle WA 98103	
Contact:	Maher Joudi; DR Strong Consulting Eng; 10604 NE 38th Pl, Suite 232; Kirkland WA 98033	
Project Location:	4800 Block Smithers Ave S; Renton WA 98055	
Project Summary:	The project proponent has submitted an application for a Preliminary Plat subdivision, which requires an environmental review by the City of Renton Environmental Review Committee. If approved, the project would result in the subdivision of a 6.06 acre property, located in the Talbot planning area of the City, into ~~21~~ 20 lots suitable for single-family residential use. The property has Comprehensive Plan designations of Residential Low Density, Residential Single-Family, and Residential Medium Density and is corespondlingly zoned Residntial 1, Residential 8, and Residential 14. The west approximately one-third of the property is within the Talbot Urban Separator and is subject to City of Renton Urban Separator Overlay Regulations. The project site is currently undeveloped.	
Site Area:	263,328 sf (6.06 acres)	*Building Area to remain:* N/A *Building Area to be demolished* N/A



Project Location Map

EXHIBIT 31